ADVANCED MANAGEMENT

Quarterly Journal

The Society for the Advancement of Management

Frederick W. Taylor

Memorial Number

1915—1940

Ten Articles on
Scientific Management Experience
Yesterday and Today
in Peace and Defense

October-December, 1940 Vol. V, No. 4

In Two Sections—Section I
Section II is the Index for the Year 1940

ADVANCED MANAGEMENT

Quarterly Journal

Published by THE SOCIETY FOR THE ADVANCEMENT OF MANAGEMENT, INC.

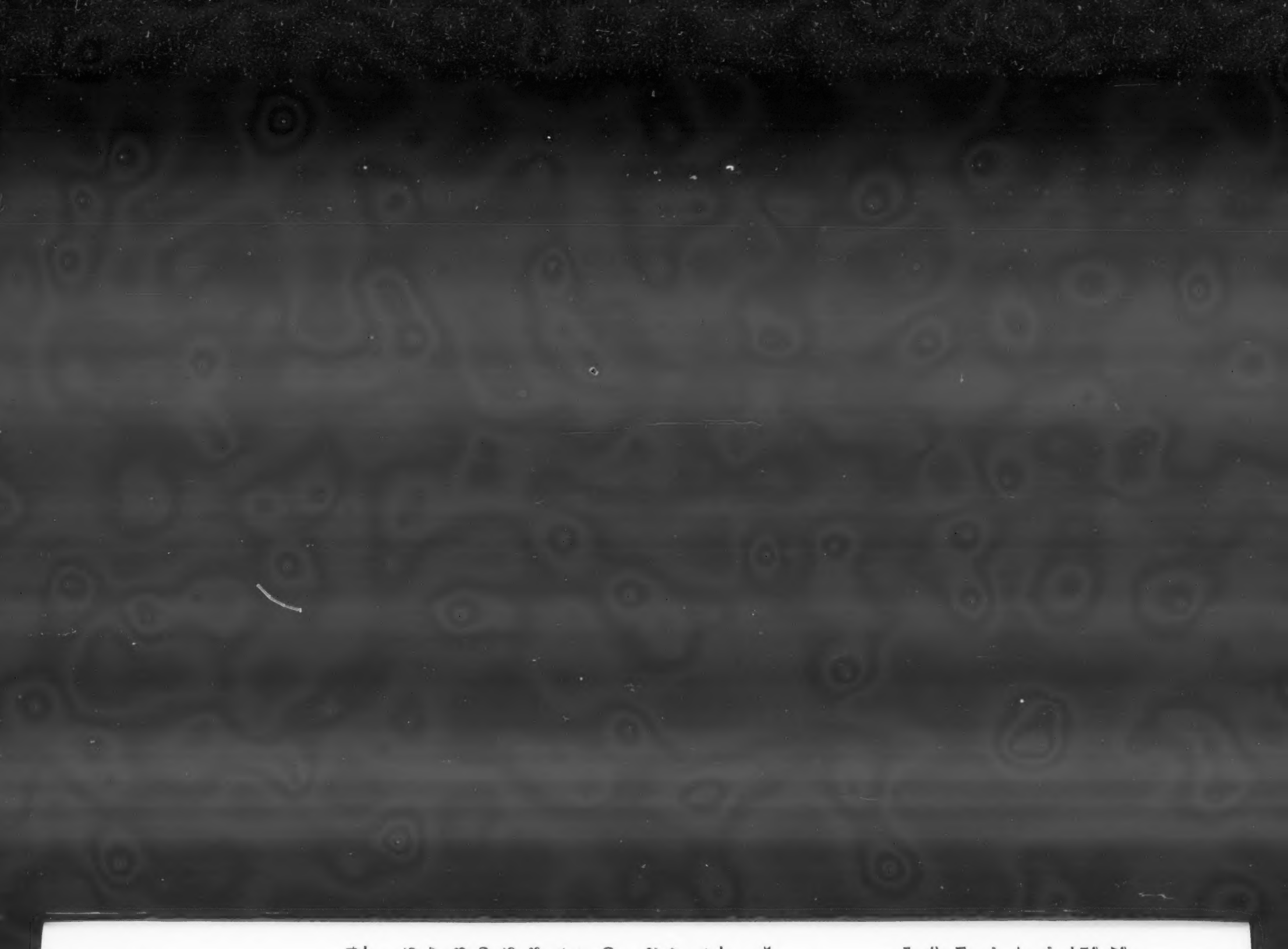
29 West Thirty-Ninth Street, New York, N. Y.

VOLUME V OCTOBER-DECEMBER, 1940 NUMBER 4

CONTENTS

ADVANCED MANAGEMENT is the successor to The Society for the Advancement of Management Journal; the Bulletin of the Taylor Society and of The Society of Industrial Engineers. Published quarterly. Per year to Members $3.00, to others, $6.00. This issue $1.50. It is included in the indexing of the Industrial Arts Index which is obtainable at Public Libraries.

Re-entered as second-class matter, December 13, 1939, at the Post Office at New York, N. Y., under the Act of March 3, 1879.



COMMENT

THE occasion of an anniversary is an occasion for appraisal. The effort of appraisal should be comparative of past and present worth and prospective as to future worth. Anniversaries may relate to persons or to events. Appraisals have to do with facts about these and with estimates of value. The appraisal of anniversaries—of men and of events—assumes that some notion of what is important and valuable is controlling in the minds of the appraisers. Indeed any sweeping and profound appraisal would not be complete unless it had established its base or answer to the obvious query—important to whom and valuable for what or whom? And it is only with great restraint that I withstand the temptation to enlarge here upon answers to these questions. Scientific management, I shall content myself with saying, is important to producers and also to consumers. Its values are ultimately social and humane.

The year 1940 marks the twenty-fifth anniversary of the passing of Frederick W. Taylor—popularly referred to as "the father of scientific management." The record of a long, active exploratory life is amply supplied in Frank B. Copley's "Frederick W. Taylor, Father of Scientific Management," a book which is required reading for anyone who would pretend to see the development of modern American management in proper perspective.

The purpose of this Comment and of the issue as a whole does not have to be historical, therefore, in any repetitive sense. The aim here is rather one of interpretation at a point in history when forces within American industry and at large in a wider area need to be understood, and when our orientation to these forces needs to be re-examined. It is an accident of history that another national defense program is launched in this particular year with its parallels to and its differences from the defense efforts of 1916 to 1918 which marked an epoch in American management practice.

Indeed, the present effort at appraisal will characterize the ongoing of events under three distinguishable periods. There was the formative period of scientific management from Taylor's early years at Midvale—the early 1880's—to 1914. There was the second period which covered the First World War and ran on to the end of the Great Prosperity in 1929. And there was the third span from then till now.

It in no way whatsoever lessens the greatness of Taylor's contribution to suggest that his application of a scientific attack to a certain body of problems was an inevitable extension of that scientific effort and outlook which were permeating the whole intellectual life of the last quarter of the nineteenth century. The scientific approach, method, preoccupation were all in the air of 1880. Industrial management, shop control and shop practice were, on the other hand, rule-of-thumb, completely empirical.

The heart of Taylor's effort, I take it, was *the radical application of the scientific method to every problem and element connected with a total grasp of a factory's operation.* It is not that he created all the methods, devices, and controls which might bring such a penetrating analysis and synthesis to function in efficient operation. But he once and for all was able to initiate and to dramatize to leaders in the management world the simple but literally revolutionary truth that to look at *management scientifically* was destined to be at once disturbing and productive to a degree. Management, he was able to show, was a matrix, core, continuum of problems and actions which were susceptible to a *scientific* approach. Today that view may seem obvious to the point of triteness; it was not so as the last century closed.

Taylor's own work, it will be recalled, yielded scientific fruits also on the metallurgical side. His "On the Art of Cutting Metals" was a brilliant contribution to technology. But it was not unique in method, area or intention. His work in the world of *managerial behavior,* on the other hand, was unique in all these respects. And it is for the uniqueness of this contribution that he is properly acclaimed.

There were, in this first period (1880-1914) of exploration, definition, creation and total orientation of a new science, the inevitable misunderstandings, crudities and even ineptitudes of pronouncement. Both managers and organized workers resisted the introduction of these new-fangled ideas. It was 1914 before any large number of industrial executives had become convinced of certain basic ideas in "scientific management," and they were not so much thorough-going practitioners as borrowers of partial techniques.

The War period resulted in a broadened acceptance of a scientific view toward management. This was because the War took many scientific management leaders to Washington where the needs of knowledge, standards and control methods had become acute not merely for use in individual factories but in respect to the production priorities of the American economy as a whole. It was at the level of the larger national controls and of co-ordination among industries that great gains were recorded during the war; and those responsible for

these gains had attacked the problems of war-time production with scientific management backgrounds. The early twenties, on the other hand, stressed a different phase of management problem. And we witnessed a series of bold experiments of management-worker collaboration in the working of certain techniques which were outgrowths of scientific management thinking.[1] The post-war period solidified and extended the gains in technical mastery and in worker participation. It was thus possible by 1929 for Dr. Harlow S. Person to edit the definitive volume "Scientific Management in American Industry," which as of that day presented a cogent, persuasive and highly practical guide to the state of the management arts scientifically viewed.

Passing to the depression era, many in the world of management gradually became aware that the slack years were unprecedentedly being prolonged after a decade of slump and were in part responsible for the eruption of a Second World War. And they began to wonder if these interrelated events perhaps demonstrated a crucial weakness in the very economy itself. The paradox of technological potentialities for high output accompanied year in and year out by actual lessening of output and augmented destitution, the phenomenon of an entire economic system seemingly unable to get itself off dead center and build, operate and produce what was so clearly needed—these and kindred facts brought profound searching of heart to many management practitioners who were disposed to carry a scientific habit of mind into areas of necessary management preoccupation out beyond the walls of one plant.

The elements in scientific method of foresight, prediction, calculated projection into the future of known facts and forces—these are now being realized by alert pioneers to have some conceivable application to and bearing upon the total national economy, upon the nation's planning, upon the whole approach to the economic and social scene as it faces another world conflict, defense program and ultimate reconstruction under novel world conditions.

If and when, hopefully, our nation is disposed to think of its provision for its needs, over and beyond the measures required in a period of war emergency, and is willing to look from a point of view of *managing scientifically* to relate resources, equipment, materials and manpower to basic human needs, at that point the Taylor influence and the logic of his contribution will have been projected significantly upon the national screen and in relation to national, peace-time welfare.

That day is not yet. The defense program will preoccupy us in the immediate future. And no doubt it will supply us with some ideas and experience as to method which should have subsequent peace-time value. The scientific method pushed vigorously to its limits, on a national scale and in relation to peace-time aims—may well prove to be one of the most fructifying conceptions and approaches our country has ever known.

The economic morass of the depression of the thirties may well be followed by the economic chaos incident to the sudden cessation of defense armament production during the middle forties.

At that time, Taylor may come into his own. Given managerial leaders of vigorous scientific cast of mind and humane outlook, our country can, if it will, take its human needs as the quantitative datum of the post-war problem, the solution of which can proceed apace. Our failure to supply the basic human needs of all today is not due to technical incapacity or national paucity of material or machines. That failure comes down to the prevalence of a widely held view that "free enterprise" is a greater human need than a minimum assured standard of subsistance publicly planned for and co-operatively engineered.

Taylor supplied a "revolutionary" method—the word is his! When we are ready to apply that method in facing the problems of our national economy as we may have to at this war's end, Taylor's reputation may then well achieve the proportions of that of a national hero!

It is possible that a Taylor Foundation devoted to clarifying, extending and explaining these ideas in their prospective bearing upon the post-war world, would be one of the most valuable, patriotic agencies it would be possible to conceive.

This entire issue is a sampling and a searching to discover those good and valuable ideas out of the past which we can carry over into building our future. That nearly every contributor specifies a debt to Taylor, or describes methods which are outgrowths of his work, may be thought to be due merely to careful editorial planning. There has indeed been editorial planning. But any body of exposition which described activities derivative from Taylor's influence could hardly fail to be impressive. The reader would find any competent record such that he could safely be left to make his own appraisal of the social gains attributable to the work of Frederick W. Taylor.

ORDWAY TEAD.

[1] I have traced this phase of the history in more detail in "Joint Management Research as an Aid to Collective Bargaining," *Advanced Management*, Volume IV, No. 3, May, 1939, pages 68-72.

Some Democratic Implications of Science in Scientific Management

By HORACE S. FRIES

Lecturer in Philosophy, University of Wisconsin

SCIENCE has been properly defined as self-corrective inquiry. Accordingly, the more basic a scientific contribution is, the more rapidly will that particular science develop as a result of that contribution. It is not surprising, then, that since the foundation of scientific management by Frederick W. Taylor, this science has grown into new areas and has adopted new means hardly imagined by him and his early collaborators.

But if participation lies at the heart of a genuine ethical democracy, then further expansion of the science into certain questions of ethics and democracy appears to be necessary. If so, we may look with confidence to scientific management to carry out this expansion. It is no exaggeration to say that it will be to the everlasting glory of that group or profession which succeeds in initiating the marriage of science to social idealism involved in democratic experimental administration. Although most of the suggestions along this line which follow bear directly upon the management problem in general, they are presented from the angle of public administration.

The exclusive identification of American democracy with majority rule and political forms of representation is misleading. For "representation" and "majority rule" without genuine participation in the decisions which shape men's destiny are already an extraneous control which may be as arbitrary as dictatorship. The only difference is that within the latter the arbitrary decisions are voluntarily reached by the dictator whereas in nonparticipating "representative" governments the "decisions"—if such they may be called—are reached by the involuntary, accidental outcome of the conflict of desires.

Yet participation, even in the United States, has become minimized and in many cases obliterated by the increase of the complexity and technical nature of the process involved in formulating social policy on however small a scale. This continual increase now appears to be inherent in a scientific age. The disappearance of significant geographical frontiers to which we could retreat when social complexities threatened to become too much for our instruments of investigation, has finally demonstrated the necessity of constructing planning instruments. In short, policy formation has become at least as technical and complicated as execution.

Accordingly, the crux of the problem of political democracy has shifted from the legislative and executive branches to what over twenty years ago Professor John R. Commons aptly described as the fourth branch of the American experiment in government, the administrative division. For given the best will in the world on the part of the legislative and executive personnel to consult, and to abide by, the interests of their constituents, the fact remains that the translation of these interests into needs harmonious with the complex conditions of our economic order is a complicated scientific undertaking. And it requires new and complex administrative agencies. Hence in our traditional democracies we are too likely to witness the interference in the achievement of democratic objectives by part of the very democratic forms, the legislative branch, which were originally designed to assure their realization.

Three factors may be listed to describe the shift of democratic concern from the legislative and executive branches to the administrative. They are: (1) the growing need and importance of the administrative departments as advisory agencies for the legislature and the chief executive, (2) the utter dependence of the latter upon the administrative machinery for carrying out his decisions and for discovering their actual consequences, and (3) the necessity for, and rapid expansion of, the quasi-legislative and quasi-judicial functions of administration.

Basic Principles of Democratic Administration

From this analysis three basic principles, also to be designated as problems, of democratic administration emerge. The first may be called the principle of departmental participation in the solution of the problem

of interdepartmental co-ordination. The importance of the problem of interdepartmental co-ordination is inherent in an economic organism where, for example, merely to mention the growing need of general economic planning, a change of policy in one industry, say a minimum wage regulation, has wide repercussions. We shall turn to the question of a scientific approach to such problems presently, for presumably the best scientific instruments available should be employed to solve them. And we shall see there the importance of participation for scientific procedures. But, assuming the account thus far to be warranted, it is clear that unless the problem of co-ordination is solved by the participation of the departments themselves, then there must be an extraneously imposed "solution" which, accordingly, is non-democratic.

The second principle of democratic administration may be called participation in administrative decisions by all employes way down the line. One necessity for this second factor, which should not be overlooked, lodges in the increasing number of employes in the administrative branch. For, according to the account being given, if they do not participate here (and consequently in our first factor) they are excluded from the democratic process. But a more important reason why this second principle is basic is that without it, scientific formulation and execution of policies are out of the question.

Our third principle or problem may be called participation by the public in administrative decisions. It is obtained in public affairs to some extent through the citizen committee, the temporary or special board or commission, and over the conference table. The shift of the center of the democratic problem to administration obviously implies that if democracy is to be continued and made a more vital reality, these channels of public participation must be multiplied and new ones developed. But this third factor is just as important as the other two for a scientific approach to adminstration. We now turn to a consideration of this question.[1]

Science is the unique feature which sets off the modern age from all previous civilizations. It is the powerful instrument for the modification of man's environment; indirectly it has modified man himself. And it promises to be used more and more for the *deliberate* change of human nature. In the space of three centuries experimental science has transformed the face of the earth. This transformation has been so rapid that "natural" social adaptation has been out of the question. The only hope for resolution of the baffling difficulties born of science lies in the formulation of these difficulties into the kind of problems which allow of self-corrective solutions.

Because of the close relation between theory and practice involved in the field of expert management, this is a promising area in which to work out a correction of the pre-scientific notion of science which prevails almost universally in academic circles. But to do this it is necessary to distinguish sharply between mere observation and experimentation.

Experimental science aims at understanding. The final test of understanding, however, comes when its abstract concepts are found to yield operational control over concrete situations. That is, although science aims primarily at understanding, its test of success is the better resolution of concrete difficulties.

Indeed, understanding itself, scientifically conceived, is an operational affair. To aim at understanding is to aim at the continual improvement of both the abstract and concrete ideational instruments of inquiry. When we carry operational analysis over into the social sciences, we see at once how unexperimentally they are usually conceived to be. For to be experimental, social science must enter the world of practical affairs in order to find fruitful concrete subject matter. For this reason there is probably more science in intelligently approached management than in tomes of academic dissertations on Economic Forces, The Social Mind, Equilibrium Dynamics, etc. Genuine collective bargaining, for example, furnishes an objective basis, the successful resolution of the differences, which not only involves various and extensive scientific inquiries but also affords an initial, tentative criterion of successful instrumentation from which self-corrective social inquiries can take off.

Another prevalent error about science pertains to the notion of scientific prediction. For this notion is often confused with the pre-scientific idea of prophecy. But the experimental scientist does not make categorical predictions or prophecies that certain events will happen in the future. On the contrary, scientific predictions are always of a hypothetical nature,—"If certain specified operations are performed under specified conditions, then certain specified consequences will ensue." Obvi-

[1] The employment of the principle of participation by no means supplants the function of the general staff. Expert service and democratic processes are not incompatible. For a fuller treatment of a democratic theory of public administration see *The Frontiers of Public Administration* by John M. Gaus, Leonard D. White and Marshall E. Dimock, University of Chicago Press, 1936, especially Chapter V, "A Theory of Organization in Public Administration," to which I am greatly indebted. Nor does the shift of the locus of the problem of democracy imply that no important functions remain for the legislative branch; on the contrary their importance is increased.

ously the success of prediction depends upon the discovery of causal connections. But these are *connections among* the concrete realities of experience. The attainment of the predicted consequences depends also upon instituting the proper human operations. The consequences are the outcome of these interacting operations; they are not the dictates of an underlying and transcendent Force or Law.

The confusion of prediction with prophecy concerns us particularly, because "scientific" social planning, so-called, which is non-experimental depends upon this error. It proceeds upon the assumption that a social plan is drawn up in advance by experts who can *foresee* the economic demands of the immediate future, arrange affairs accordingly in a blue-print, and then turn the execution over to administration as traditionally conceived.

Genuine experimental social planning, however, is less simple than this static notion of social science. At the same time it avoids the dictatorial notion of *a social plan* inflicted from above in favor of the democratic *institution of continuous social planning* with the participation of those affected by the plan.

Let those best informed about the concrete, discoverable features of an unsatisfactory social situation confer with experts about the various special aspects involved. Let them agree tentatively upon the *formulation* of the problem for a possible way of resolving the conflict. *Let the formulation be made in the interest of improving the instruments of planning* by using as a criterion of success the resolution of this and subsequent actual difficulties. The tentatively suggested solution constitutes a social plan. Let this plan, this *hypothesis,* be put to work to observe its consequences as a test of planning instruments. Eventually the planning instruments will constitute the abstract subject-matter of the social science. They will continue to designate concrete operations to be performed within our institutions to resolve the difficulties which emerge in this continuous process. The abstractions will constitute the *stuff* of the explanations of the social world, and these explanations will doubtless be found to be as relative, changing and progressive as our explanations of nature.

The objection to the idea of social experimentation rests its case upon the claim that scientific control of human beings is out of the question. Now such control is doubtless out of the question (except possibly by means of hypnosis) when conceived to be necessarily an extraneously imposed affair of which the "elements," in this case we human beings, must be kept in ignorance. But unless *knowing* is conceived as an *unnatural* social phenomenon, there is obviously no justification for such a notion of control. For, on the other hand, if we may assume that social-causal relations are involved among humans who know something about what they are trying to do, then there is every reason for attempting a rational type of social scientific control. And such control, until tried and found wanting, is presumably feasible.

The democratic claim now to be made about the possibility of scientific social control would not call for proof were it not for the prevalence of the pre-scientific notion that human nature is something fixed, static, essentially unco-operative and therefore requiring external forces to bring it into line. Yet when people are frankly asked to participate in a genuine, undogmatic and experimental effort to resolve obvious social difficulties in a common undertaking, all moves and proposals of which are above-board, the evidence is clear that they respond, slowly and cautiously at first but eventually with genuine enthusiasm.

Now experimental social scientific procedures require some degree of this same co-operation. For data must be gathered and furnished as well as interpreted in terms of the plans for the purpose of achieving better instruments and planning. But data do not come labeled as such. They must be "intuitively" discriminated through having a *sense* of what the real problem is. They must be critically weighed relative to data which are or are not relevant. Discrimination and critical weighing imply some insight into the plans (the hypotheses) under consideration. The more insight the better, for the more likely, then, are crucial and unexpected but relevant factors to be observed and recorded. Thus the conditions for ideal social experimentation are at one with the conditions for democratic participation in social planning: those experimented upon are those conducting the experiment through co-operation with experts from all relevant specialties and with one another.

The Nature of Scientific Data and Control

Let us now state the import of these principles and problems of democratic administration in view of this analysis of experimental procedure. We have argued that in order to maximize participation in public administration and thereby secure and enrich democratic processes, channels of participation must be established from the public up through all levels of the various administrative departments to the top where the basic problem becomes that of interdepartmental co-ordination. But

according to our analysis of experimental procedure, this condition of democracy coincides exactly with conditions imposed by social experimentation. Two main factors in experimental method determine this coincidence from the side of science. They are the nature of scientific data and the nature of scientific control.

The fact of this coincidence between scientific and democratic processes, if fact it is, justifies our every effort to clarify our ideas of science and democracy as thoroughly as possible in the interests of both. But to do this we must purge our idea of democracy from hangovers of an age when the struggle against nature made democracy a mere dream of the future. For science, by ridding itself of the fear of nature without sacrificing its respect for the powers and orders of nature, has converted important aspects of the material world into man's co-operating servant; and this in spite of our failure to stimulate and practice ecology, and the consequent abuses of nature in many applications of science.

There was a time, furthermore, when the struggle among men for the limited fruits of nature made the too rapid widening of the area of co-operation a liability in the struggle for existence. Now science has given us fruits in such quantities that our want of co-operative techniques requires us to destroy those in excess of the "effective demand" and to reward manufacturer and farmer through subsidies or fixed prices, for maintaining an artificial scarcity in the midst of actual want and demand.

We must also purge our idea of science. There is no reason to believe that knowledge is constituted of some rare element as yet undiscovered by physics or chemistry. There is every reason to believe that it is a natural product of interactive, communicating human beings struggling for adjustment between themselves and their environment. But the pre-scientific and pre-democratic idea of knowing still vitiates our vision of science, with disastrous effects in social inquiries. There was a time when only the aristocratic élite had the leisure for "genuine" knowledge, for knowledge, that is, which was anything more than a hand to mouth matter of relative and changing opinions on the part of "managers" and other artisans. Real knowledge was then eternal, fixed, unchanging. It was an affair of high and difficult intuitions or self-evident axioms—self-evident, of course, to the élite. It was a delightful indulgence, apparently designed by the deity as a compensation to the élite for the inherent, barbaric harshness of the natural world of change and decay with which even they were doomed to have relations for a brief three-score and ten.

But a radical innovation has transformed all this. Experimental inquiry is not an individual affair but a socialized, interdependent, co-operative enterprise. The experimenter deliberately seeks exceptions to his "laws" and theories in order that they can be reconstructed into more effective instruments. Intuition has become the name for the functioning of critical imagination in originating hypotheses to be tested. Fortunately inquiry has retained its quality of delight even for children and morons; but ever since Bacon proclaimed it, scientific knowing has been a source of power which our tradition tends to treat as a "pure" decoration to the stream of life. Yet the powers over nature it has released have given us a taste of heaven on earth and have begun to induce the association of change with the possibility of progress and with delicious variety rather than with decay and untimely destruction.

With the *possibility* of progress, for if these new powers over nature are themselves to be controlled, then traditional notions of "efficient and scientific" administration must be revised. And although fundamental revision of traditional notions requires less time than courage and imagination, many will hesitate to delay the "solution" of a problem long enough to formulate it in such a way that progressive, self-corrective solutions and reformulations become possible. Yet those experts in administration who are willing to put their faith in the strength of a union of science with democracy are increasing. At a certain point the number will be sufficient to bring to pass a change of social direction, and a self-corrective society will be developing.

As illustrations of changes in administrative ideas required by our analysis, we may choose almost at random five significant points from a thoughtful and constructive paper by Harry Arthur Hopf, "Administrative Co-ordination."[2] He tells us (page 52) that "the fourth requirement [for a flexible framework for co-ordination] . . . involves the separation of planning from performance, a *sine qua non* of effective organization." Yet this separation is just what we must avoid according to the democratic scientific procedure outlined above. Mr. Hopf seems almost to admit as much by implication in what immediately follows. For he continues: "Progress in undertaking such separation is often attended by conflicts between the points of view of the staff, which is responsible for planning, and the line, which is

[2] *Advanced Management*, April-June, 1940, Volume V, No. 2, page 50ff.

charged with the accomplishment of satisfactory operating results. Unless conflicts can be resolved in favor of co-operative action, sound conditions of administrative co-ordination are impossible."

No doubt Mr. Hopf is here stating the careful observations of trained experts in management. An empirical survey of traditional administrative procedures may reveal that where the separation between planning and performance has obtained in the past, administration has been more "successful." But in evaluating this point, and the four which follow, three questions should be kept in mind: (1) Has the "success" following the use of these five ideas expressed by Mr. Hopf been the result of democratic or non-democratic processes? (2) Was it an experimental, self-corrective achievement? And (3) has this "success" been decreasing in recent years in large administrative agencies?

The second point. A basic principle of Mr. Hopf's position (which if unsound by no means vitiates many of his suggestions) is that the objective of management (and presumably of the administration of a government department) is predetermined. Clearly, according to the democratic scientific principles stated above, this supposition must be rejected. For as regards democracy, the legislative functions (however it be with formal organization) are no longer extraneous to administration; and if democracy means participation, then the objectives of management (in the narrow sense of the term) *should not* be extraneously determined. Furthermore, the "should" in this last statement designates an intellectual, as well as a moral imperative. For, as regards science, the only "predetermined objective" of experimental procedure is the resolution of the actual difficulties in such a way as to improve continually the instruments for resolution. The division of labor within the experimental enterprise does not follow extraneously imposed objectives. The objectives themselves change and develop from the development within science.[3] "Scientific management" in the past has sometimes been considered merely an instrument for achieving predetermined ends. But as ends become fluid in the increasing flux of social change, the error in the narrow conception becomes more and more evident.

The third point in Mr. Hopf's paper which seemingly conflicts with the democratic scientific procedure suggested above is (p. 55) that we should "encourage assumption of individual authority wherever possible in preference to group authority." The fourth point of divergence is so closely related to the third that they may be considered together. Mr. Hopf's claim is (p. 55) that we should "keep the activities of committees strictly within limits which, while promoting free discussion, will avoid impingement upon operating functions."

Again it would seem that Mr. Hopf all but contradicts these two injunctions in his excellent emphasis upon the importance of the democratic principle of decentralized administration and in his next statement, which we must also welcome, (p. 55) that we should "place authority as close as possible to the point at which action originates." For to the extent that administration is decentralized and authority located with the source of action, the responsibility and authority for co-ordination are usually group affairs. Unless responsibilities (and therefore *working* authority) are atomic affairs, and co-ordination, therefore, a complicated but not difficult problem, it would appear impossible always to individualize authority and responsibility as Mr. Hopf seems to visualize.

But it is important to note an ambiguity in the term "individual" or "individualize." Clearly Mr. Hopf thinks of the "individual" as something over and against the "group." But these concepts of individual and group are no longer psychologically or socially adequate. The modern problem of authority and responsibility is *to develop, to invent, an individualized group responsibility and authority.* It is because authority and responsibility *are* largely group affairs in the modern corporate world that our old atomic individualistic notions of them have become inadequate.[4]

The fifth and last point of divergence with Mr. Hopf's article is over his statement (p. 56) that "while subordinates may be credited with sincerity in what they advocate and with intimate knowledge of the minutiae of operations, they are usually inadequately informed with regard to principles and insufficiently equipped by

[3] In the history of science the particular kind of difficulties to be attacked at a given time have often, if not always to some extent, been determined by practical, industrial and national needs. The course of the fictitious entity called "pure science" has followed the demands for application. But this fact simply vitiates any theoretical distinction between pure and applied science; it does not constitute an extraneous determination of objectives. Any one who today can put faith in scientific procedure would hardly argue that even the selection of particular areas of attack *should* be made non-scientifically if and when scientific selection is possible.

[4] *Individualism Old and New* by John Dewey (Minton, Balch Co., 1930) should prove very suggestive on this question; and *Human Nature and Conduct* by the same author (Henry Holt, 1922; Modern Library, 1930) is the most basic psychological study of the entire question with which I am acquainted. For one example of a step taken in the direction of the application of these psychological principles to administration, see "Notes on Governmental and Industrial Administration in a Democracy" by Morris L. Cooke, *The Society for the Advancement of Management Journal*, July-September, 1938, Volume III, No. 4, page 139ff. As he says (page 140): "Co-ordination in any deep sense means not only the interweaving of functions, but also the interweaving of responsibilities and their complimentary authorities." It is unfortunate that many experts on social matters (obviously excluding Mr. Cooke) take the concepts of individual and group to be evident and clear without analysis, when a minimum of reflection about them shows that they are two of the most difficult concepts, practically and theoretically, we have, and about which we know little as yet beyond the significant area of anthropology.

experience to grasp the fundamentals involved." Again, this is no doubt a true empirical statement. But instead of pointing to the importance of separating considerations of "method of procedure or control," not to mention general policy, from the co-operative functions of all line employes, it indicates that in-service training is a fundamental and inherent aspect of modern democratic scientific administration. Consequently the omission of consideration of the basic question of democratic procedures from most of the numerous and otherwise excellent treatises on government in-service training is nothing short of tragic.

Most government employes are eager to discuss and study questions on the meaning of democracy, the function of government in general, the particular functions of their own and other departments, and even the function of their own humble positions when these are viewed as moments in an interdependent and organic process rather than as isolated pigeon-holes which, to an unenlightened view, appear to be entirely arbitrarily established by the whims of legislators or executives.

Furthermore, it is important to distinguish between the want of the dynamic quality associated with executive ability and want of understanding of governmental and administrative principles. There are subordinates in almost all departments who could not possibly become successful executives but who actually understand the functions of their own departments and the general nature of administrative processes better than their successful chiefs. Indeed, as Mr. Hopf states, the successful executive must frequently take advice discriminately from some of his better informed subordinates. Why should not this necessity be recognized in administrative organization and generalized? The person at the place of action is likely to have good advice about that action, provided he has been trained to know what the action is about. Hence, his advice should become an acknowledged part of the collective administrative decision. Needless to say, the authority and responsibility of the line employe need not and should not exceed his ability.

Practicality

The suggestions made above for democratic scientific administration may sound completely impractical. Yet modern management experts are accustomed to large and complicated problems. A word in closing may be called for, however, in regard to "practicality."

What is practical under certain social conditions may be highly impractical under changed conditions. Also, the advent of experimental science has instituted radical social changes which have become evident and pressing with the disappearance of the geographical frontier. What, therefore, may prove upon trial to be most "practical" in the sense of workable for modern conditions may be highly "impractical" in the sense of not being what is customary or commonly manifest in our lagging habitual practices. But some of our habitual practices have become highly impractical and are ever more seriously failing to work successfully. As Amos said in explaining to Andy the meaning of *status quo,* "It's Latin for the mess we're in."

The most serious deficiency of administration as "practically"—that is, as habitually—conceived is that it takes for granted the problem in hand. But both scientifically and practically the formulation of the problem is the most important part of the resolution of the difficulty. For the way the difficulty is formulated into a problem determines whether or not the "solution" reached will actually move in the direction of resolution and the improvement of the instruments of investigation or whether it will tend to complicate the difficulty by shoving it out of sight to emerge later in an enhanced form and as a tougher problem. Accordingly, a number of our "successful" solutions in the past appear now to be solutions of improperly formulated problems and not, therefore, actual resolutions of the difficulties out of which the problems emerged.

Furthermore, the urgent and impatient demands made upon it—demands for quicker action at less cost and with greater effectiveness—often force administration to scramble through the immediate difficulty as "best" it may without raising the scientific question of improving experimentally its instruments for better formulation and resolution of the actual difficulties which harass it. The adoption of experimental procedures constitutes the correction of these deficiencies and, at the same time, the correction of academicism in the social sciences and of social irresponsibility in the nature sciences. For it implies the *organized* co-operation and interfusion, if not the identification, of public administrative personnel with our science faculties. It is not surprising that democracy faces a crisis. The surprise would be on the other side, that democracy has survived at all in the face of the short-sighted and conflicting demands which business often makes, were it not for the fact that democratic forms do incorporate important non-economic values as well as, to a degree, their traditionally acclaimed economic opportunities.

But if we are to establish firmly in the modern world

(Please turn to page 164)

Increased Production for Defense Needs

By SANFORD E. THOMPSON

President, The Thompson & Lichtner Co., Inc.;
Lieutenant Colonel, Ordnance Department, U.S.A. 1917-1918

TODAY the need for speed in armament production is even more urgent than in the First World War. Yet our progress this year has been slower than in 1917. Then we fell back on Great Britain and France to furnish all the heavy ordnance used by our Army in France even up to the very close of the war. Today we have no such reservoir. Our problem is to profit by past experience and to speed production.

Rapid placing of orders of course is necessary. But this is only the beginning of progress. Rapid production of the goods after orders are placed is the key to progress.

The cause of failures in the last war was traced back to management—management in private industry; management of the railroads; management of government. Concentration on the solution of management problems is the need today.

This is a bold statement but it is based on experience in both industry and war that:

> Total Productivity of war matériel can be increased at least 20 per cent by raising the management methods of most of the plants to the standard of the best plants.

This means the availability for more production of one-sixth of the men employed. It means, since speed is governed by the slow producer, a great advance in time of completion of the vital elements of our program.

A further assertion, based on the former World War experience:

> Final delivery of complete units can be expedited to an even greater degree by correlating production of all components entering into a complete unit.

To one who does not understand the detail involved in manufacture, these statements may seem ridiculous. The modern manufacturer, who sees his work, or that of plants making component parts, falling behind will appreciate the opportunities that exist.

Vital Delays in 1917-18

Records show that actual deliveries in 1917-18 were far behind promises. Our cables to the A.E.F. in France during the War, going over my desk in Washington, presented continual corrections—always backward—in expected shipping dates and reducing of promised quantities to be shipped. For example, on January 10, 1918, the plants making them estimated that 532 of the 75 mm. guns on order would be completed by April. A total of 212—less than half—were produced at that date. Of these, only 85 were completely finished. But none of these 85 guns was shipped to France in April. In fact, out of orders for 10,000, only 143 were shipped before the Armistice in November. Similar discrepancies between promises and performance occurred in almost all items of matériel.

8″ seacoast guns and railway mounts, 18 were expected by June, 1918, and only one was complete on that date. 4.7″ guns and carriages, 150 expected and 24 ready. 155mm. howitzers and carriages, 135 were expected by June and none was ready because no recuperators would be ready until July. Other shipments were held up by lack of sights, limbers, and firing platforms. 2,000,000 shells were ready for shipment in October 1918 but all were held up because they lacked adapters and boosters.

At the close of the war, industry was coming into its stride and production was accelerating faster than in England or France. But it took far too long to get to this point. Even then there still existed the uneven deliveries of component parts or items. The saving grace was our high production of rifles, our speed in providing explosives, and the use by our overseas troops of artillery made by England and France.

This is past history, but it is of utmost interest today if we examine the causes of delay and avoid them in our defense production.

Causes of Delays

Prime factors in production during the First World War were all of them management problems:

1. Organization for War.
2. Development and adoption of standard designs.
3. Tooling up for production.
4. Correlation of parts delivery both by government and industry.

5. Internal management of industrial plants.

Delays due to the first three factors are in large measure inevitable in any stupendous undertaking, but can be greatly lessened. It is the last two in which I am particularly concerned; both of them are subject to vast improvement.

1. Organization for War

At the beginning of the First World War, the Army Ordnance was conducting a business of $14,000,000 a year. It employed 90 officers and 700 enlisted men and almost no civilians. In May 1918 13 months after war was declared, it was doing business at the rate of $4,000,000,000 a year through direct appropriations and authorization of contracts. To handle this business, Ordnance built up an organization of 5,000 officers and more than 20,000 civilians.

The rapidity of organization in 1917 and the inexperience of many of the officers were naturally responsible for errors in procurement and production. Now, in 1940-1941, past experience is being utilized to a considerable degree.

Procurement, that is the placing of orders and selection of contractors, requires a thorough knowledge of the capacity of the equipment in the various manufacturing plants, including small neighboring plants with machines that can be utilized for sub-contracts. Not only this, but—a point far too often neglected then and now—it requires also a knowledge of the skill of the executive personnel of each plant to manage and accelerate production. Delay in delivery of one small part will prevent shipments of an entire unit.

Organization in the plants themselves is equally essential to government organization. Plants must often be geared for mass production. Airplanes, for example, have been practically "custom made." An approach to mass production may require revamping of the organization.

2. Development and Adoption of Standard Design

The multiplicity of parts that go into the make-up of seemingly simple items of matériel is little understood. Each part must be designed and approved. Then the factories receiving the orders must "tool up" for their manufacture. Too great haste in ordering may mean ultimate delay in delivery. The items must be capable, not only of fulfilling their objective, but must be designed for speed in production. The famous Garand repeating rifle, now finally accepted as Army standard, is said by some authorities to be designed so as to be unnecessarily difficult to manufacture in mass production. Changes in design, unless made for the purpose of increasing productivity also cause delays. The problems require the attention of the best practical designers in the country.

Orders for American aircraft are only just being consummated in the fall of 1940 because of the momentous decisions required on types and designs. Maintenance of already accepted standards is essential for mass production.

3. Tooling-up

Tooling-up in many cases includes the design and erection of the factory to make up the orders.

The vital parts of much of the equipment for war were then and are today made in machine shop or metal working plants. One of the most important problems in management involves machine tool equipment. An appreciable part of this equipment in our automobile plants is "single purpose" machinery, which is not adapted to other products. Remember, too, that to make the machine tools to make the newly required parts, other machine tools are needed and may have to be made. Before a 10" cannon can be tooled, special lathes must be made and the machine tools for making the lathes must be obtained.

All these things involve obtaining raw material, training personnel, and production or adaption of equipment. They involve detailed development of material and production schedules, in order to find the weak spots in advance.

The attitude of the personnel is an equally important factor. One large manufacturer of skirts who had just taken an order for army blankets told me that his manager objected on the score of his employer's lack of experience. The manager was told that he was simply making "skirts for horses," and the way was cleared.

4. Correlation of Deliveries

Lack of correlation of delivery of items and components to make up complete units was a major cause of delay in 1917-1918. It will be one of the major problems in our present defense production. The problem is largely one of management. It involves not merely the keeping track, by the War and Navy Departments, of promises and deliveries. It involves factory operation of the highest modern type. The day-to-day solution of this problem in our defense efforts will be one of the prime opportunities for the prevention of the woeful delays of the last war. With

proper correlation of deliveries of items and parts, it will be possible to beat the 1917-1918 performance to a standstill. Without it, there will be the same doleful progress.

The complications and the detailed problems to be solved in 1917-1918 were tremendous and today they are similar both in procurement and production. A single shell for the 75 mm. gun, urgently needed in France in 1918, consisted of 63 parts. Each had to be manufactured separately. Many of the parts came from different plants in different parts of the country. Every one was necessary for completion of the shell. Materials used in the making of such a shell included steel, copper, lead, tin, brass, bronze, felt cardboard, paper, calico, and tinfoil in addition to the explosive.

Shortage of "adapters" and "boosters" were two of the sorest points.

Manufacture of the 75 mm. American Model 1916 field guns required gun forgings from three plants; heat treatment for one of them from another plant; machining from four other plants; and carriages, with recuperators, from still others. Moreover, a battery of field guns was composed, in 1918, of four guns with carriages, having three caissons and caisson limbers to each gun, one two-horse reel to each battery for providing communication with the fire control, one six-horse reel and cart for each brigade headquarters, supplemented by battery wagons with their forge limbers and store wagons and the necessary fire control. Yet we think of 75 mm. guns as a single item of equipment!

One poorly-managed plant could and did hold up entire shipments of armament.

Airplanes are sometimes thought of as being produced in a single factory but, in addition to the airplane itself, parts of which are usually built in different factories and assembled at the airplane plant, there are the accessories embracing, propellers, shock absorbers, stabilizers, starters, tires, wheels, brakes, windshields, landing gear, batteries, lights, radio, parachutes, safety belts, oxygen supply equipment, clothing and goggles. Most of these items, because from different industries, are built in different factories. All are essential and an airplane is not ready for flight until they are provided. A deficiency in any one item holds up the final use of the plane.

Management correlation centers in the various branches of the government. In our new defense organization, there must not be too great reliance on manufacturers' promises. Many of the manufacturers, sweating blood to make deliveries, do not know the real causes for their own broken promises. They need help more than criticism.

In the former war General John T. Thompson in charge of the Small Arms Department of Ordnance received the D.S.O. because he was never short on requirements. His Department, through the management of Colonel Reed, a civilian officer of long experience, utilized the Gantt Chart for follow-up.

In the present emergency, there must be complete appreciation by officers both of high and low ranks and by the Advisory Commission of the absolute necessity for minute and detailed follow-up. This cannot be done by sitting in one's office and writing orders and "requests." It must be done through analysis of systematic and uniformly designed progress reports from manufacturing plants and a follow-up of the bottlenecks directly by check-up at the plants.

5. Management in the Industrial Plants and Arsenals

The problem of production is complicated now, as it was in the World War, by the need for giving many contracts to concerns with no experience in producing the particular item required and often with the necessary equipment not yet installed.

There must be throughout the Departments an appreciation of the technical skill and experience needed to find the cause of delay or of excessive cost in a particular plant and to correct the difficulty. The Advisory Commission to the Council of National Defense must appreciate the need for examining production methods in individual plants and working with the plant organization to correct deficiencies instead of adopting the attitude of depending upon "the companies which receive defense contracts to meet the delivery dates specified in such contracts."

Harking back to the last war to visualize opportunities now existing, I recall the results of visits to various plants and Arsenals in December 1917, made at the request of the Chief of Ordnance. Some of the plants were right up to schedule; many were sadly behind. The chief delays in the various plants at that time, eight months after War began, were found to be caused by:

(1) Government slowness in making decisions on design and its tendency to make changes in design during manufacture.
(2) Priority difficulties between departments.
(3) Delays in ordering minor parts.
(4) Lack of required raw material.
(5) Handicaps from new plant and machinery.

(6) Slowness of sub-contractors.
(7) Lack of inspection standards.
(8) Antiquated executive plant personnel.
(9) Poor methods of estimating and accounting in the plant.
(10) Defective work which wasted time and material.
(11) Lack of authority of inspectors and production men to enforce speedy production, and faulty liaison with Washington.
(12) Insufficient planning of intricate or even of simple production, resulting in unequal distribution of work to machines and men, with consequent falling behind in the production of certain parts which delayed completion of an order.
(13) Shortage of labor, especially in smaller plants located near Government establishments or near private plants paying high wages.
(14) Transportation delays.
(15) Shortage of fuel.

This is a varied list, and yet most of the items come right back to management—management in government and management in industry.

Then and Now

It is evident, that in this period we are facing the same problems as in 1917-1918. Then we had, in a very few lines, the advantage of experience in making equipment on English and French orders extending over a longer period than now. General Crozier, the far-sighted Chief or Ordnance, had carried preparations as far as possible pending appropriations. Now, we have had a preliminary "tooling-up" in many plants selected during the past two years as those adapted to filling orders for various types of material. Railroad facilities are now ahead of 1917-1918 and trucks are available for transportation. Fuel is plentiful.

In the last War the Chairman of the War Industries Board, Bernard Baruch, insisted upon his appointment in April 1918 that the Board must be the final authority on purchases and allocation of orders. So far in November 1940 we have no such final authority except the President. The Advisory Commission to the Council of National Defense, up to the date of this writing, has an advisory capacity only. This is a primary defect in our present organization.

In factory management, which was responsible for so much of the delay in 1917-1918, there has been a vast improvement which will be evidenced in more exact time estimates of delivery, in speedier production, and in better quality maintenance. The point which must be recognized is the fact that while many of the plants have fine management methods, a great number of those to which orders must be given are woefully lacking in modern methods of production control and standardization. Even most of the best plants are subject to appreciable improvement. Again, I must repeat that delayed delivery of one component in a complete unit makes the prompt delivery of all the rest of the components absolutely useless. Guns are useless without carriages and sights. Shells are useless without explosives and timers.

Boosting Production

The speed of our defense program may be a matter of life or death to our country. Realization of this must be brought home both to government and to industry.

Management in government involves prompt decisions, with politics eliminated; well-regulated priority requirements in raw materials and in scheduling production; skilled government inspections in the plants; follow-up of individual orders to correlate them for scheduled time of final assembly; assistance to manufacturers in meeting schedules.

Management in the industrial plant involves acceptance of orders with assurance that delivery dates can be met; knowledge of the capacity of every department and piece of equipment; maintenance of the raw materials' inventory required for orders; knowledge of the time required to replenish raw materials or manufactured parts; knowledge of standard times required for every machine and work place; planning of manufacturing orders sent to the shop based on advance knowledge of the capacity of each department and of each essential machine; entering these orders in the shop in the sequence and volume that will insure progress on schedule time; maintenance of production records that keep both plant executives and the government officers constantly informed of status of progress; establishment of measures of productivity for the workers; maintenance of quality through planned inspection methods; and gaining the thorough interest of the workers in doing every job quickly and well. To accomplish these things requires an organization of executives experienced in management methods and labor relations.

It might seem that all these are obvious requirements of government and industry. True, but they are all es-

sentials in production which are vital in our defense program and so often woefully neglected.

I cannot take the time to go into each of these points in detail, based, as they are, on personal experience both in war and industry. However, the handling of details is so essential that a few of the most important requirements must be emphasized, especially the correlation of component parts of a unit through follow-up of plant management and the means by which productivity may be accelerated with the co-operation of labor.

Correlating Component Parts

The problems in physical production and in the area of human relations thus presented to management of American industry are of a magnitude and complexity not encountered in peace time. The correlation of parts and items involved in the vast number of independent orders is the responsibility of government. Such correlation is essential to dovetail the production of different components into unified schedules of delivery, and it realistically involves a close follow-up of the plants filling the defense orders.

Orders, both for raw materials and manufacture, involve correlation not only within one Department, but also among the Army, Navy and other departments of government. An authoritative overhead control is essential. In construction, for example, millions of dollars are being expended by various authorities and new housing contracts are being let without proper reference to defense requirements or expenditures. Soon there will be conflicts in priority of materials and of men.

Correlation requires establishment of definite management methods. Charts of the Gantt type which show in graphic fashion the comparative progress of the different components, based on plant reports of uniform style, were effective in the last war where used. These same methods are being introduced now in the Army Ordnance Department. The problem is enormous. There would seem to be need of tremendous increase in the activity in this line, both in Washington and in the local branches, or we will find ourselves in the same predicament as in 1918 in master planning, correlating and scheduling in Washington and in the local branches, and moreover, these charts and records must be utilized in an intimate follow-up of work in the plants themselves. To obtain accelerated production requires intensive action rather than appeal to the manufacturer. Reports on progress of sub-contractors are as necessary as, perhaps more necessary than, reports on the work in the main plant.

It is possible, by such means as these, to have such efficient correlation that the assembly of complete units can be expedited to a degree unheard of in the last war, when the lack of balanced production was a major cause of delay.

Increasing Productivity

To increase productivity, there must be not only maintenance of schedules but an acceleration of production of key items and of the program as a whole.

I stated above that total productivity can be increased at least 20 per cent in addition to the increase which may be made as a result of better correlation. It is obvious that increased productivity can be attained by expanding equipment and utilizing miscellaneous tools in small neighboring shops. But the increased productivity is attained by developing management methods, as has been outlined, and is in addition to gains from expansion of equipment.

Many plants at the present time have the highest type of management. In many others accepting contracts, the management is haphazard. That such plants can be brought up to scratch is proved by the fact that it has been done in plant after plant in private industry. In fact, even the best plants are subject to improvement.

Each plant must be treated as a special problem since no two are alike, nor can a universal "system" be adopted to fit all cases. In our present emergency, short cuts are necessary; for example, elementary time studies usually take too long and financial incentives to workmen are often impracticable because of the variety of parts to be made. Standardization is vital but must often be approximate. "Ritual" must be avoided. Improvement must be in terms of modifications of present methods to correct specific defects without upheaval of personnel or organization. Above all, changes must be made by the plant personnel with co-operative advice and assistance from experienced executives and consultants where needed, but not as abritrary requirements. The problem is not the introduction of "system" but the modification of production methods to fit the new conditions.

Many shops operate with uncontrolled day work, rudimentary inventory control, estimating and pricing data in the head of one man accumulated through long experience, and with the planning of production in the shop based on what the management desires rather than what the plant can put through its limited machines.

Foremen are hounded for not meeting impossible schedules and workers are nagged for low accomplishment. Orders are inevitably behindhand.

As an illustration of the way to correct such deficiencies as these, let us take a hypothetical but representative case of a small machine shop manufacturing products with some parts taken from inventory stock made in the shop and other parts from new orders run through the shop.

To correct such a situation as described, and a very common one in industry, it is necessary to key back to a single fundamental—standards of production: standards of production for accurately planning and scheduling; co-ordinating personnel and work ahead; establishing reasonable replacement times for stock made in the shop so as to permit intelligent determination of re-order points for stock parts; and finally, standards for the establishment of standard unit costs and estimating data, the deficiencies in which played such havoc in the last war.

The standards, representing normal performance obtained, (not by averaging, but by thorough analysis of records) finally used (not for piece work, which necessitates intensive study and a length of time out of the question in such an emergency as we now have) are for measured day work with daily and weekly records of each man's production to keep the management informed and to furnish the worker with a definite objective. The operator is given in advance the rate of production, pieces per hour, expected of him to produce at 100 per cent normal.

The standards of normal performance are then utilized as a basis for scheduling manufacturing orders into the shop so as to balance plant personnel and unfilled orders.

Each foreman can know in advance when he will receive his parts, the man-hours work required in his department, and when his product is due to pass on to the next department. But it is up to the foreman and not to any centralized control to get the work done.

For the large plant, with mass production and assembly lines, procedures are different but the same general principles of standardization and control apply with equal force.

All this may seem like technical detail, and so it is, but the development of management methods in a plant through such detail as this has increased unit productivity in key departments of plant after plant from 15 per cent up to 50 per cent. Moreover the workmen through the development of their initiative and recognition of actual accomplishment take a lively interest in their daily work. The need for greater productivity and especially the delivery of parts on time can and must be met if we are to produce our armament quickly.

Conclusions

The major needs for accelerating production may be summarized as follows:

1. An authoritative central control of all lines of defense in procurement and production.
2. Subordination in priority of non-essential governmental activities to defense requirements.
3. Elimination of politics in government and private dealings.
4. Prompt decisions, cutting "red tape" when necessary in priorities, in procurement and in production.
5. Selection of contractors who can fill the orders on time and with results of required quality.
6. Assurance of satisfactory labor relations.
7. Allocation of orders so as to co-ordinate delivery dates of all parts and components of each unit or assembly.
8. Intimate contacts between government and the producing organizations to keep track of progress through personal and routine reports.
9. Correlation of the production of parts and components by the government through systematic methods such as Gantt charts.
10. Follow-up by government of delivery of all parts on time, not through mere demands but by aiding manufacturers to meet their problems. This objective may make it desirable for government to employ experienced management consultants and production engineers to advise with management on their particular problem.

All these requirements must be met and meeting them demands skilled personnel in government and business, a personnel capable of thoughtful planning—and then prosecution of the plans. It means government inspectors competent and well-trained and with authority properly to balance perfection specifications with practical limitations and needs. It means simple but specific reports that can be utilized for control and follow-up of contractors and sub-contractors, with appropriate and immediate action on warning of threatened departures from planned production on even a single item of a unit. It means such action whether in the realm of labor, subordinate managerial personnel, general management, materials, or engineering.

Scientific Management in Government Operations

By GEORGE D. BABCOCK

Director, Engineering Management, Federal Works Agency

THE widespread depression at the beginning of the last decade was largely instrumental in stimulating the use of Scientific Management principles in the conduct of governmental affairs. As we all recall, business and industry, reaching an all-time peak of activity in 1929, suddenly slowed down or for a time stopped entirely. The highly capable scientific and management personnel utilized through the preceding years by the directors of these enterprises, to attain this peak accomplishment, were almost overnight disassociated from such activities.

Their techniques and managerial practices, captured by these enterprises, were made available to younger lower-salaried persons. Few, indeed, of this original personnel near 40-years of age, and practically none of them much older, were recalled to the enterprises from which they came.

Because of the economic crisis so quickly reflected throughout industry, government was forced rapidly to expand its activities. Realizing the need to sustain the morale of those affected, and having an acute need of the services of trained and experienced men and women to carry on the increasing affairs of government, it was quick to take advantage of the services of those so recently disassociated from private industry.

Obviously, great adjustments in the living conditions of such persons were necessary, but once made, the newfound freedom of action, the opportunity for a wider field of original thinking and applied practice, gave them a compensation they had never enjoyed when privately employed. Because of this circumstance, constant progress in improving procedures and establishing new management standards has been made in each specialist's field. Their contributions, which had formerly been limited to a rather small number of large private organizations, were now made available, through the medium of governmental agencies, to the management techniques of all enterprise, both governmental and private.

Today the management of governmental affairs makes use of classified, standardized information and employes technically trained for specific tasks far more extensively than did American business at the time of Frederick W. Taylor's death when his extremely important studies and his technical and philosophical contributions to this vital subject ceased. The growth to the present widespread application of Scientific Management principles by business, industry and government was so gradual that this accomplishment is not generally recognized.

Dr. Taylor's techniques, it is true, have been somewhat supplanted by others, new and often less exacting. Changes in business and governmental activities and in industrial products and processes have required the use of new management procedures and techniques. The scientific methods and special mechanisms used by Dr. Taylor to determine fundamental performance values and to record them for practical use are now frequently supplanted by others. Because of these changes a misconception has arisen that his principles of Scientific Management are no longer in force, and that present techniques bear no relation to those he used. This is far from the fact, for those fundamental principles are today very much alive and active. Management is not a stop-watch, a bonus system, or any other mechanism or combination of mechanisms.

The purpose of Scientific Management is to achieve order from disorder, simplify complexities, displace uncertainties with certainties, and determine the "one best way" of accomplishing a definite objective. Although these desirable attainments are not always to be reached at first, such management persists in searching until they are attained. That "best way" is important. It must be remembered. So, to preserve it for future use, it is recorded. In time a whole library of "one best way's" for many accomplishments is accumulated. Once a best way is found and recorded, it need never be redetermined.

Actually today, throughout all phases of the largest business in the nation—the United States Government—wide application is made of the fundamentals of good management which were determined, organized and promulgated by Dr. Taylor. They are:

First. The development of a science for each element of a man's work, thereby replacing the old rule-of-thumb methods.

Second. The selection of the best worker for each particular task and then training, teaching and developing the workman;

in place of the former practice of allowing the worker to select his own task and train himself as best he could.

Third. The development of a spirit of hearty co-operation between the management and the men in the carrying on of the activities in accordance with the principles of the developed science.

Fourth. The division of the work in almost equal shares between the management and the workers, each department taking over the work for which it is the better fitted; instead of the former condition, in which almost all of the work and the greater part of the responsibility were thrown on the men.[1]

We now find that, through vocational and scientific school training, the extent and diversity of facilities for the development of skilled workers and functional specialists are immeasurably greater than in Dr. Taylor's time. We find workers' participation in management expanding through the medium of labor organization representation. There is an ever-widening dissemination through the medium of magazines, books and in training work by professional men and women of Scientific Management methods which had their birth in the work of Dr. Taylor.

To broaden the background against which to accentuate the salient features of present management practices the pertinent facts regarding his studies and contributions to this subject must be recalled.

During the late '80's and early '90's his interests were centered in giving public and written expression to specific proposals for improving industrial operating conditions. By that time he had solved, through recognized research methods, most of the hitherto troublesome management problems connected specifically with machine shop operation. Of these, the basic problem was that of regularizing production; i.e., planning for and controlling operations to the end that finished products would be available in point of time, quality and cost, in accordance with pre-determined values.

Considering the previous practical lack of such desirable attainments in factory performance, these accomplishments were truly revolutionary. Many supplemental problems connected with the mechanical processes; i.e., uncertain material quality and supply, inappropriate machines and tools, and workers' ineffectiveness due to lack of information and facilities, were necessarily solved as prerequisites to the solution of the major problem. Until solved each limitation of performance, now recognized as having been largely due to the lack of appropriate management planning, had been accepted as necessary irritants in the operation of industry.

[1] Adapted from *The Principles of Scientific Management* by Frederick W. Taylor, Harper & Brothers, New York, 1913.

By virtue of the information gained by his experience in the solution of these problems through rigorous research practices and unique methods of analysis, Dr. Taylor deduced certain fundamental principles of production which he formulated and later published in a book entitled "Shop Management."

Intrigued by the possibility of applying the principles promulgated for this limited field of endeavor, with other principles he conceived deductible from researches in business and industrial affairs of wider scope, he continued his philosophical and technical thinking and experimentation. He also encouraged others who were interested in improving management practices to contribute their conclusions from research in that field. Emboldened by the widespread interest shown in his proposals and finding in industry and business evidences of advanced, though unrelated, management practices, Dr. Taylor composed his findings and in 1911 released for publication his treatise "The Principles of Scientific Management."

Early Factory Conditions

It is essential that factory operating conditions of those earlier years, as contrasted to the present time, be understood in order to comprehend the reasons for evident variations in the application of those principles to present government practices.

The operating conditions in force in one typical machine shop industry in 1908 were even more advanced than those found in the shops where Dr. Taylor carried on his first investigations. The "load" for this branch of industry, except for certain rapidly expendible railroad products, was furnished by railroad equipment, steam engines, some electrical generating and motive machinery, crude agriculture machinery, and Army and Navy ordnance products. The finished products of these industries were composed of many parts and subassemblies in relatively limited quantities of varied design. This was still an era of highly decentralized small and medium job shops, equipped only with general purpose machinery, and utilizing but few jigs or fixtures for holding and guiding work. The few special tools used were commonly "made" by the workmen solely for the single purpose of the "job in hand." The workman, an all-round mechanic, was expected to perform any operation on any machine in the shop and if "baffled" by a job, he worried over his failure to make good. Truly, this was no place for a novice. To become a member of this fraternity of master mechanics was the hope often endured for a lifetime of every son of these

men and by others who entered the shop as "roustabouts."

In the early months of 1907 a revolution started in the amount of American industrial output and practices. The gas engine was then sufficiently reliable to use commercially in vehicles, in electric generating equipment, and as a source of mobile power in agriculture operations. The increasing demand for gas engines necessitated a greatly accelerated rate of output. This large-scale quantity production of common design machine shop products eventually brought with many other gradual changes the transition from master mechanic to machine operator and finally in large manufacturing plants to an operation specialist. The master mechanics gravitated into supervision and tool and die work.

The above-mentioned freedom of action of the workman in the shop required a corresponding freedom of access to production materials, shop supplies and tools. Drawings were more "general" or "over-all" than detailed. This was equally true for material shapes and machine types. Stocks of standard steel sheet and bar forms were stored without control in open racks throughout the shop. A job once started by a workman was seldom transferred to another; thus absence from duty, or urgency of some other job the workman may have previously started, caused delay. Some of the men, for one reason or another, but chiefly due to lack of material or change of design, and not infrequently the lack of tools, had as a result many jobs in many different stages of completion.

The workman was the only person who really knew the condition of a job or could estimate the time of its completion. If many parts or sub-assemblies were required for a major finished assembly, stock chasers from the final assembly would run from man to man who worked on these parts in different departments of the shop to "wring" from him a promise for their completion time. However, the fact was ignored that the mechanic could not buy materials or special tools or correct a defective drawing or provide power when his belt or main line motor "blew," nor could he do a thousand other things required for his successful performance. So the delivery time promise was governed by the known conditions of the moment, or lacking even that information, were promised merely to make the stock chaser feel good.

From the general sales schedules, schedules for subassemblies were made and delivered to the foreman. These were merely copies of the original schedule of finished product, but were dated earlier by one, two, three or four months. From this schedule each foreman was obliged to plan the production for each mechanical operation. It is evident that the scheduling rested in the hands of these stock chasers who represented the assembly floors.

Foremen assigned individual jobs to the workmen, supervised them at their work, and discharged them on any pretext without appeal. They further ordered repairs for machines and equipment, and selected and procured tools and supplies.

The foremen and workmen decided on the mechanical methods to pursue at the work, the number of pieces to be run on each operation, and the time at which the work could start. The prime responsibility rested on the workman, with the foreman as runner-up. This was evidenced by the considerable labor turnover on the charge of "unsatisfactory and delayed work," though there was very little turnover of foremen.

The result of this, as we now know, could hardly be unexpected. The plan of dual responsibility showed the usual weakness of indecision in emergency, lack of correction for faults due to uncertain responsibility, and doubt and distrust due to lack of knowledge. Opinion was pitted against opinion, and a general feeling of indefiniteness permeated the shops.

Production dates called for by the management were not kept, primarily due to uncertainty and irregularity in the scheduling of operations. Material shortages were frequent. Tools were unsuitable and lacking. Machines were not best suited to the purpose and were often in poor repair. Neither tools nor machines were standardized, and work could not be exchanged rapidly from one to another. Shortages of parts were constant and serious causing a very high ratio of preparation to operating time; through this inefficiency a resultant high peak of workman effort was caused.

The change in the number of workers was frequent. A large percentage of employes were poorly trained and irregular in attendance. The management, the foremen, and the workmen were continuously at odds over results. The purchasing department was forever rushing or holding up material orders, and of course, the people from whom purchased suffered the same experience.

Fluctuations in labor employment varied from 110 to 200 per cent through the working year. Labor turnover, measured by the number of new men employed to maintain the force, was about four and one-quarter

times, that is, approximately four and a quarter men were employed to maintain a stationary payroll.

Salable products were not ready when wanted, but were over-plentiful when not wanted. Of course, many sales were lost, and during the delay changes in design caused partially finished product to be cancelled and often scrapped. The employment of labor followed the rise and fall of the output curve. If requested, wage increases were sometimes granted. Costs and consequently the sale prices were high.

To remedy this situation and obtain orderly arrangement of work and certainty of output, action was taken to obtain exact information with respect to every operation in process, then simple direct standard procedures for regularizing the work processes to be retained were established. These standards included those for methods of work, routing of work, materials, equipment and accounts. The time in which work was to be accomplished and the date on which it was to be concluded were very important items for co-ordinating all activities aimed at a common objective to assure its being reached as planned. The relationships and responsibilities of the personnel and their exact duties were discovered and recorded. Aided by these studies a final straight-line organization was designed and established. Responsibility and authority were properly related.

The development of a successful and equitable form of management is essentially a science, and must be built up on definite basic laws of justice, equality and efficiency. Control must be co-operative, but nevertheless absolute. The establishing of control is an important first consideration, and naturally closely follows the standardization of classified products, materials and machines.

Dr. Taylor's principles of Scientific Management stipulate: First, the development of the science and, second, the selection and training of the workmen to conduct efficiently their share in the co-operative activity developed under such management. The science is not completely developed with the introduction of the control, the assumption by the management of its logical and proper responsibilities and the efficient interchange of instructions and reports, until equitable wage rates and sustained recompense are also established. This is part of the development of the science, and at the same time, is the resultant consideration upon which the selection (classification) of the workmen must depend, as well as the incentive making for their intensive training.

When the mutual advantage of hearty co-operation is once grasped, as it tends to be during the sane and careful development of the science, the workman is naturally attracted to the work he is best fitted to perform, and the very human desire to secure a high rate of pay causes him to strive for a higher rank in his class and to acquire the necessary skill which demands and assures promotion. Thus the second principle is closely dependent upon the first, and it is in fact difficult to differentiate between them in an actual application of Dr. Taylor's principles to the management of present-day industry. In fact, the impossibility of deviation in the practical application of these fundamental principles emphasizes their basic and inseparable co-relationship.

Selection is largely a matter of employing the right man for the right place and it should be freed from any taint of favoritism. In an organization composed of a considerable number of divisions this can be best secured by concentrating the authority of employment and discharge in one person who is directly responsible to the management. This concentration of authority eliminates as far as possible the evils arising from the entrance of the personal equation into the employment problem; that this personal equation should most certainly be eliminated is evidenced by the fact that the promotion and demotion of workers in a large part of the industrial population of 1907 was based on 20 per cent efficiency and 80 per cent personal relationship.

Justice must be the cornerstone for fair and satisfied employment, and likewise must be the basis for fair and equitable recompense, both to management and to workmen. This is the groundwork of Scientific Management—an equitable division of work, just treatment and fair recompense. The worker is virtually set up in business for himself and must give his best, both for his own interest and that of the organization. Fundamentally it directs first towards individualism and then to group action which will finally culminate, when completed, to concerted action for all classes and trades towards common interests—in no sense antagonistic to the welfare of the management. It provides for a gradual movement of the least-trained worker to the status of master workman, and supervision to managerial staff position. There is then no sharp line of demarkation between the worker and the management.

The co-operation between management and workmen and the division of work between these two branches of industry—the third and fourth of the principles of Scientific Management as expounded by Dr. Taylor—can be plainly traced throughout the development of the science and the selection and training of the workmen.

In fact, the four fundamental principles of Scientific Management are so intimately and mutually co-related that it is quite impossible to draw sharp lines of demarkation in their practical application, or for that matter, between the responsibilities of the management and the duties of the workmen. This in itself, though it may not seem to establish the result, does tend toward creating the necessary co-operative action and division of work, for a practical working organization built on Dr. Taylor's principles must be based on clearly defined duties for each and every individual.

Results of Scientific Management

Taking into account the mentioned actions which were consummated to reorganize the management plans, let us view some of the results.

By virtue of the standards established, it was possible to determine the length of time work should be in process from the date of requisition of material to the shipping of finished product. In this the appropriate time allowance for the purchasing agent to bargain, buy and deliver to stores was a large part. Requisitions were explicit regarding the time for delivery of material on definite dates.

The results brought about by the changes in product and methods were of secondary importance unless the gains were permanent and assured of continued betterment. As knowledge once gained and properly recorded is not readily lost sight of, there should be no question of the permanency of gains already realized. As for continued betterment, this can only be assured if the workers have gained and benefited with and in proportion to the realizations of the company. If this has been true, a continuance of improvement cannot fail to come about.

The most pronounced results which affected the men were: largely reduced turn-over, larger percentage of permanently employed, higher earnings per worker as recompense for greater achievement, greater satisfaction in accomplishment, materially increased knowledge of shop practices and office methods, relief from unfair responsibilities, better living conditions, shorter working hours and the generally accepted attitude and understanding that the management is to serve the worker in full measure as his, the worker's, industry serves the management.

Lack of skill on the part of men who applied for mechanical work, and in times of pressure the lack of time in which to train them was one of the large causes for labor change. So many more men must be employed to carry out a task than are finally required after they have become skilled and adapted to their task, that there must come a time when a considerable reduction in number is necessitated. In fact, this is one of the real regrets of a manager who is obliged to employ a somewhat untrained force in larger numbers than should be required to get out the work; and as this force becomes skilled, to reduce it by the necessary lay-off of men who have earnestly tried to bring the production up to full requirement.

It now seems incredible that the conditions I have related were commonly found in force in this nation's shops no longer than thirty-seven years ago. This will be news to a large number of my readers who are working in modern industries and governmental establishments. To them such employment would now be unbearable. However, the importance of present orderly regularized work and good working conditions they experience were first recognized and promoted by Frederick W. Taylor, although not broadly experienced by him before his death.

Again I reiterate that mechanisms are not management nor is science always applied to good purposes. As notable in the European War vile uses can be made of nearly every truly good idea and device. So by the use of a stop-watch hidden in a pocket to time a man's work long before Taylor used it openly as a standard time-measuring instrument and also long after he had completed his great determinations, unscrupulous foremen in their relations with the workers waived every principle of management-worker relations that Taylor stood for.

Some others in higher positions than foremen used and are using in factory affairs equally unscrupulous methods that Dr. Taylor abhorred and contended must be stopped if his management principles were ever to serve the high purpose he envisioned. Fortunately as these principles became widely dissemminated and more generally adopted throughout business activity, such unfair practices have been largely eliminated, except in some less progressive shops where an unintelligent management still holds sway.

Taylor could not stand a "slacker," but greatly admired a capable, efficient worker and had a host of personal friends among these men. No compensation for professional services to those contemplating the adoption of his principles and practices were ever accepted by him—he did not contemplate this high service as a profitable venture.

Several of the persons associated with his develop-

ments became professional counselors with regard to the utilization of his principles. Their services were of inestimable value to those who sought them. There soon, however, appeared a group of so-called "efficiency experts" to sell their wares. A very few of these were earnest, capable men who were determined to hold to the high ideals of Scientific Management practices. The others in large numbers so clouded the public's understanding of the objectives of Scientific Management and translated so imperfectly its true value that a recovery to sane realism was slow. However, schools of higher education adopted management curricula to include the teaching of its fundamentals and in a generation have been instrumental in regaining respect and promoting its restoration to the field of useful services.

One of the earliest applications of Taylor's exact methods of installation in a machine shop was in the Ordnance Arsenal at Watertown, Massachusetts. Here similar mechanisms to those used in developing original standards were also used. Although his management principles in all particulars were introduced, the time determination caused trouble, evidently unnecessary, as all facts later indicated. The planning work then obviously radical in relation to the workmen's previous normal experiences, the alterations of long-established shop habits and the readiness with which protests were received by influential sympathetic persons all contributed to this particular difficulty. Again it was "method," not "principle," that was involved. This defect could have been remedied to the advantage of all concerned.

Today in the government arsenals, in the Navy Yards, in the Government Printing Office, and throughout the several construction agencies of the Government, a high standard of management based on facts scientifically determined is practiced. Practically every fundamental principle deduced by Frederick W. Taylor is recognized in so far as it applies in non-profit activities. As referred to in the early part of this article, public facilities available to service the modern science needs of management are now many, few of which were available to government shops and business enterprises of his day. Among these the selection and classification of workers nationally conducted by the U. S. Employment Service and U. S. and local Civil Service. Our nation-wide professional schools and universities now have regular courses in management methods, budgeting, accountancy and many other special courses which deal with the principles, methods, procedures and standards determinations, all developed in the beginning by **Dr. Taylor.**

There is still an unlimited opportunity to improve governmental performance in all branches of activity and in permanent agencies many basic performance and procedure standards not now in use would be helpful to regularize and control the flow of work. I am confident this will be accomplished in a not long period of time.

Some Democratic Implications of Science in Scientific Management

(Continued from page 152)

these economic opportunities, not to mention the re-establishment of the important non-economic values, traditionally linked with democracy, then a new and daring type of practice is evidently called for. There is reason to believe that our public administrators and expert industrial managers are among those best equipped to institute these new practices. We have a right to believe that they can do it if they are willing to consider a few of the urgent practical, philosophical, and scientific questions at stake. If they will continue to take the initiative, the academic world will be forced into line more rapidly than when the nature experimental sciences triumphed over academic resistance.

Faith these days that democracy will survive is sometimes charged to be wishful thinking. But it is as much fearful thinking to conclude that democracy is done with—and would remain fearful thinking even after several generations of dictatorial indoctrination. But the fear will help to eclipse democracy, and a working faith is necessary for its preservation. For if any lesson comes to light from the emergence together in the modern world of experimentalism, political democracy, and industrial autocracy, it is that experimental methods put deliberately to the service of democratic aims can achieve a self-correcting modern society.

Labor and Management Under the Defense Emergency

By MORRIS LLEWELLYN COOKE
Consulting Engineer, Philadelphia

IN THE years since 1933 our world has demonstrated a peculiar inability to foresee that sequence of events which as we look backward seemingly should have been as plain as the proverbial nose on your face. In numberless and fateful situations the traffic signals as to coming world events were clear enough but we failed to heed them possibly because our attention was centered on matters of lesser import. The duty of the hour is to make every effort to anticipate the future as accurately as we may and then plan in advance to cope with it and conquer it. This is good technique for nations as well as for individuals. To postpone planning until the stress and strain is on leads to unnecessary complications and possibly to disaster.

Here it is intended to outline a possible—even a probable—drift in the management phases of the production of war munitions as we approach the peak of the emergency and resulting from this the changing attitude which those charged with the "total defense" of the United States must of necessity assume. The maximum of production and social well-being are the outstanding domestic objectives for a democratic people either at peace or at war and quite as much when actively preparing for a possible war. As the stress of actual war—or an anticipated war—deepens, as between these two objectives, a constantly increasing production becomes of relatively greater importance. We will safeguard social well-being of course all we can, even try to add to it, especially as to details not in conflict with our war effort. But in case of a really significant clash between production and social well-being which cannot be adjusted without sacrificing either interest, production must have the right of way. This does not of course imply the easy abandonment of hard-won social safeguards because of trivial difficulties encountered in their observation.

Adequate preparedness—and war itself if it comes—imposes then two new attitudes on "a people who are free and who by God's help intend to remain free." First we must stress broadly conceived social well-being as a *factor in survival* as never before—always attempting to offset such concessions as are demanded by the emergency through developments at points heretofore neglected in whole or in part. For instance, this would be a grand time to begin *man-fashion* and *with every thought of victory* the fight on soil erosion and depletion of other natural resources. One tough struggle—such as our current military task—makes all others seem relatively easy. Second, as the call for production becomes more imperative, and public as contrasted with private demands increase, the government will inevitably assume new and increasingly drastic—even if temporary—attitudes toward the conduct of private industry. If this situation is recognized before the emergency becomes too hectic, the necessary procedures can be put in process with the least disturbance to democratic theory and to our long-run industrial philosophy.

How grave such a situation may become is indicated by a statement of Winston Churchill on becoming Prime Minister (May 19, 1940): "In that supreme emergency we shall not hesitate to take every step, even the most drastic, to call forth from our people the last ounce and the last inch of effort of which they are capable. The interests of property, the hours of labour are nothing compared to the struggle for life and honour, for rights and freedom to which we have bound ourselves." Or note Clement Attlee's remark made a few days later that "Government should be in control over persons and property—'not merely over some persons and some property but over all persons, rich and poor.'"

Even in normal times under a system of private enterprise, there is an increasing tendency for the buyer—especially the buyer on a large scale—to set up certain types of controls of the manufacturer; such as through, (a) more detailed specifications covering quality and even the actual processes through which it is to be effected, (b) clauses in the contract stating and ensuring definite delivery dates and (c) other clauses implying social considerations such as that the work must be performed by union labor. Obviously, when this is wisely done, there is left to the management all that is really essential to effective managerial control. On the

other hand, as the emergency deepens, private industry must be prepared for a degree of "interference" from governmental authority to which it has not been accustomed.

Through the long years of a sellers' market this idea of the self-sufficiency of the management of industrial enterprises—usually interpreted as meaning the top man or a small top group—was so firmly imbedded in American thinking that perhaps government representatives —military and lay alike—will need to change their attitude even more than the industrialists themselves. "When it comes to making airplanes," said one government official recently, "we will depend wholly on the airplane industry" and this in spite of its being a young and very active industry which can hardly have found itself in matters of managerial techniques.

Manufacturers, of course, "must be held responsible for production," but they will not be able to secure it in sufficient volume without help of many different kinds from the representatives of government. As was said in the order establishing a production engineering department for the Emergency Fleet Corporation in April, 1918, "It is becoming increasingly apparent that the E.F.C. cannot continue to be *observers* of the operations within the yards. We must do more than audit and inspect; we must encourage and help and, where conditions warrant, assume a necessary control—not only assume a measure of control but act on it." Sometimes a producer in seeking maximum production may need governmental protection from influences beyond his own control. Obviously, it will be equally important in any scheme for "total defense" for the workers—organized and unorganized—to hold themselves in readiness not only to respond as nearly 100 per cent as possible to the requests of government, but to realize at the same time that the government is an indispensable aid to their reaching their fullest effectiveness..

Inspection

It is always important, and in some cases a matter of the direst necessity, that the government should know that what it assumes is taking place in a given industrial plant or area, is actually taking place. Therefore, the routinizing of governmental inspection of the conditions under which work is being executed for the government appears to be basic to the establishment of an effective relationship between government and an adequate national industrial effort. And it is important here to note that the purpose of inspection under scientific management is to make sure that things are right rather than to discover what is wrong.

The readers of this Quarterly know that there are certain industrial procedures which have world-wide acceptance in efficiently managed industrial establishments, even though the percentage of plants which have actually installed these procedures may be small. Take as an example accurate planning for a project as a whole and for all its constituent parts to the end that each element of the total effort may be completed in consonance with the whole and according to a predetermined schedule. There is also a well-developed technique of follow-up work by which progress is continuously compared with the plan, fixing responsibility for delays and enabling those in authority to concentrate their efforts on removing obstacles (or bottlenecks). Procedures of this kind are now in present-day use in certain government-owned plants for the furtherance of work being done there and in certain government departments for watching the progress of work being done in private plants for government account. If the national industrial output is to reach "total defense" proportions, surely such practices which have been developed through the years as an effective aid to large-scale production and into a highly scientific branch of management, must be made routine, rather than exceptional, throughout American industry. To do what it can to effect widespread installations of this character will become one of the responsibilities of government. However necessary such procedures may be their application is rarely easy. The development and installation of effective managerial mechanisms demand both skills and great fortitude. To assume that good management can be bought at a lesser price will prove a costly error.

It is now pretty generally recognized among management engineers that such changes in practice can best be effected directly by the employes of the concern manufacturing the product under professional guidance and supervision rather than by a corps of temporary employes recruited for the purpose from the outside and later to be discharged. This makes it possible for the government to carry on a far-flung educational campaign within industry through a modest directing staff. Some of the elements of the art and science of management such as planning and follow-up work mentioned above appear to be more immediately important in their effect on increasing and speeding up production. But at the proper time and in the proper way each of the following sub-divisions will find its place in a considered program:—routing, costs, storage, payroll practice,

plant layout and maintenance, time study and foremanship. The educational drive for the wider introduction of such practices into industry can be carried on in various ways such as through the circulating of specialized leaflets, conferences with the officials of plants obviously needing rejuvenation and "short-horn courses" in manufacturing establishments and at educational institutions covering a given management mechanism to be available to carefully selected workers and managers, and moving pictures illustrating preferred methods.

The total effect required to produce war munitions may be divided into two parts. On the one hand, there is the effort involved in the design of the product and the working out of the processes through which it is to be manufactured. This, in the case of many products, will be largely engineering. By far the larger part of the cost for most products especially those made in great quantities will, however, be involved in the labor and superintendence required to produce the article. As in all other phases of industry, the responsibility *in the first instance* for recruiting and organizing and operating this latter staff, must rest with the individual producer. But where it is established that certain procedures tend toward satisfied employes and uninterrupted operation, the government will increasingly demand their introduction. The establishment of a system by which grievances can be heard and adjusted, is a mechanism of this character.

What is to be the answer to certain employers who are demanding, more and more insistently, lengthened hours and lower wages in the interest of national defense?

Mutual Standards

As I see it, there have been set certain standards as to hours, wages and working conditions which are considered as being consonant with the public interest. Other than those established by legislation such as the Wages and Hours Act, these standards have resulted largely from collective bargaining—as well-ordered as the present state of this art permits. These standards should be continued. Any changes, as the necessity therefor appear, should be effected through the normal processes of collective bargaining. We want more of this mutual setting of and adjustment in standards rather than less of it. This is the only way in which our industrial effort can be unified either for peace or for war.

The millions at present unemployed should be absorbed by industry before the question of revolutionary changes will become at all pertinent. On any given job it is always possible to get the employe to work longer hours by paying overtime rates. If the necessity demands it, the employer can work his plant two or three shifts.

One can easily anticipate a time, as today in England, when the day-to-day emergency will require that many commonly accepted practices affecting employers and employed alike must be thrown overboard. If such a situation ever arises in this country, however, the emergency must be such as to call for sacrifice from everybody—employer, employed, and every-day citizens. We will know when that time comes. There will be a common recognition of the need.

To raise our industrial effort to its highest possible peak, the elimination of current wastes will be an important factor. Waste frequently results from the lack of what might be called good housekeeping—littered floors, and "such like." But we should have it in mind that both the employer and employe are responsible for current waste and inefficiency in industry. In the report "Waste in Industry," signed by Herbert Hoover—then Secretary of Commerce—and sixteen other engineers, by far the larger share of the responsibility for waste was assessed against management. On page nine it is stated, "over 50 per cent of the responsibility for these wastes (all types of waste) can be placed at the door of management and less than 25 per cent at the door of labor." Further, the report reflects the widest differences in the efficiency with which plants are operated in the same industry. The most nearly uniform record was made by the textile industry where the best plant was reported as being only 50 per cent better than the least efficient. But in most industries there was much less uniformity in the performance. For instance, in the metal trades, the industry largely responsible for the production of the implements of war, the management of some plants was reported as being over four times as effective as in some others.

Labor's Share in Management

In normal times, labor takes the position that the level of management is up to management—something as to which labor has no responsibility. Labor naturally takes this position because since the early days of the Industrial Revolution labor has been told in no uncertain tones that management is none of its business. But if an emergency should arise in this country where labor is asked in the national interest to throw overboard—even in part—the standards which have been set up for

(Please turn to page 176)

Non-Financial Incentives[1]

By ROBERT B. WOLF

Manager, Pulp Division, Weyerhaeuser Timber Company

THE phrase, "non-financial incentives," had its origin in the meetings committee of The American Society of Mechanical Engineers.

In 1914, while the author was Manager of the Burgess Sulphite Fibre Company at Berlin, New Hampshire, he became conscious of the fact that in this plant an immense amount of creative energy had been released. In a period of about seven years, the output of pulp had more than doubled. The quality had been elevated from the poorest to the best, and production costs had been reduced.

This in itself was not so remarkable but the fact that it had been brought about without resorting to profit sharing, bonuses, piece work, or the use of any form of financial incentives was apparently something new.

In the development of our methods of organization, no particular philosophy of management was "invoked." There was simply a desire to increase output, improve quality, and lower costs, using whatever procedures that at the moment seemed best for the purpose.

This fact is important for it indicates that the non-financial incentive idea did not result from the application of a particular pre-conceived plan or system of management, but was rather the discovery of a "natural" law of human nature already at work in a large and successfully operating industrial establishment.

Our only guiding principle during the early part of the development was an unrelenting search for a true understanding of the forces we were dealing with.

At first, to be sure, our efforts were concentrated upon the material aspects of the problem; i.e., on chemistry, physics and mechanics. Our volume of output had been retarded because the pulp quality was not sufficiently high to attract customers. We therefore found it necessary to discover and control the factors affecting quality.

Our technical staff consisted originally of a chemist and an engineer so we added enough technically trained individuals to enable us to record and evaluate the then existing operations.

It was our purpose to discover how consciously to modify and alter the manufacturing processes in such a manner as to produce a pulp of uniformly high quality and thereby increase the demand for our product. And we were having a lot of fun doing it.

It did not occur to us to inquire into the principles of management we needed to employ to obtain our objectives. Not, at least, until our success had attracted the attention of others in the pulp and paper industry, and they began to ask us what methods we used to get our results.

The perfectly obvious interest in their work shown by men all over the plant *was* an accomplished fact, but why, we were asked, do the workmen keep up their interest day after day when they are simply paid so much per hour. It was in order to answer these questions that the writer began his studies that finally led up to the formulation of the principle of non-financial incentives.

Before proceeding with illustrations of the application of this principle I will relate the events which resulted in the publication of the A.S.M.E. paper by that name.

In 1914, eight years after I took charge of the operations of the Burgess Sulphite Fibre Company, I wrote a paper entitled, "Individuality in Industry," which I proposed to submit to The American Society of Mechanical Engineers. On November 17, 1914, I sent this paper to Mr. Frederick W. Taylor for his opinion of its worth, and of the likelihood of its being accepted by the Society. I received a letter from him in reply from which I quote the following:

> The main body of your paper is a very magnificent critique both of Scientific Management and the old style of management. . . .
>
> It would seem to me that the proper society before which to present this paper would be the Society for the Promotion of the Science of Management, every member of which is thoroughly interested in Scientific Management. They would fully appreciate what you have written. Of course, I may be mistaken in these views, but I have a strong feeling that if your paper was presented to the Meetings Committee of The American Society of Mechanical Engineers, that it would be turned down, merely because these people would have no notion of what you were driving at.
>
> Please do not misunderstand me. I am not detracting in any

[1] Adapted from an address delivered before the Industrial Relations Conference at Stanford University, March 27, 1940.

way from the value of your paper. I am merely giving the frankest advice as to the reception which I believe it would receive from The American Society of Mechanical Engineers.

I am personally very greatly interested in your analogy between good management and the human nervous system. It is most original.

On December 5, 1914, in spite of Mr. Taylor's advice, I sent in my manuscript to Mr. L. S. French, Editor of the A.S.M.E. Journal, and on February 11, 1915, I received a polite note reading as follows:

The Committee on Meetings have given your paper on Individuality in Industry careful consideration and have evidenced much interest and pleasure in reading the manuscript. It is with regret that they find they will not be able to assign this to the Spring meeting and we are, therefore, returning the manuscript to you.

Meanwhile, the First World War was in progress, and America was beginning to question the efficacy of the motive of personal gain as the mainspring of human progress. Various types of incentives were spoken of in "management" discussions and the writer became active in advocating the abandonment of financial incentives in favor of incentives which stimulated the workman's desire to acquire greater knowledge and skill. This, it was pointed out, could be accomplished by the daily posting of records that measured the progress made by the individual in improving the quality of his workmanship.

After April 6, 1917, when the United States formally entered the war on the side of the Allies, we began to hear much about the value of the individual, and democracy was declared to be the "organization of society upon the basis of respect for the individual." We became a nation of crusaders out "to make the world safe for democracy." We have since come to realize that the task is probably how to make democracy safe for the world by preserving it in its representative or republican form, the only form of government that can preserve respect for the individual.

It was in this "atmosphere" that the meetings committee of The American Society of Mechanical Engineers, because of the interest of the Management Division, asked me in 1918 to present a paper on the subject of Non-Financial Incentives, a subject in which they seemed not at all interested four years before. The paper was delivered at the Annual Meeting in December 1918, a month after the signing of the Armistice.

The main purpose of reciting the above facts is to indicate the rapidity of the change in view that took place within a space of four years.

In 1914 when the war began it was almost axiomatic among management engineers and executives that to increase output it was necessary to stimulate the acquisitive instincts of the workmen. In 1918, when the war ended there was a distinct interest in other forms of incentives, and in some quarters an uneasy feeling that unless some motive other than personal gain could be brought into play the forces of disintegration let loose in the world might change democracy into autocracy, and finally even into anarchy.

Quite a number of industrial engineers of my acquaintance who had once been ardent advocates of financial incentives came finally to the conclusion that the constant stimulation of the acquisitive instincts of the individual lead to separatist tendencies and a lack of co-operation. To overcome this tendency group bonuses were tried. "There would be co-operation within the group," they reasoned, and this proved to be true.

The reward was felt to be a little more the *effect* of increased effort rather than its *cause*.

However, just as formerly individual workmen's rewards tended to get relatively out of line with the skill and intelligence required, so it was with the groups, and adjustments had constantly to be made in order to avoid interdepartmental friction.

Today the *tendency* is to remove the direct economic stimulus (perhaps economic pressure would be the better word) still further away from the individual by making him conscious of the progress of the plant *as a whole*, and even of the corporation itself if the plant is part of a larger group.

This is being brought about by "reports to job holders," so much in vogue these days, and which in the opinion of most of those who have tried it, is time and effort well spent.

The acquisitive instinct natural to man, if stimulated in the formative period of his life is almost sure to become the dominant motive of any group, department, plant or corporation he may later direct. And the greater his power, the more damage he can do if his efforts are not actuated by the primary motive of interest in the general welfare. Should we not therefore consider the ultimate effects upon world affairs of constantly stimulating the acquisitive instincts of our employes?

I would like to suggest that a totalitarian nation is basically an integration of its productive groups into a single over-riding economic unit actuated by the motive of "financial" gain.

Theodore Roosevelt showed his keen historical insight when he wrote:

Robespierre and Danton and Marat and Herbert were just as evil as the worst tyrants of the old regime, and from 1791 to 1794 they were the most dangerous enemies to liberty that the world contained.

However, Robespierre and his kind have passed, so in a more hopeful vein let me quote from a book by Frank Townshend called *Earth*:

In the end, the earth does not tolerate domination;
Neither by races, nor nations, nor classes, nor institutions, nor individuals.
You can read that fact in history;
Or you can go on making more history,
And then read the same fact.

Nor does it matter that the dominating power consider itself to be the incarnation of rightness and benevolence.
It is a characteristic of dominating powers, to consider themselves incarnations of rightness and benevolence.

The period of each kind of domination varies with its nature;
Race domination being the longest,
Individual domination the shortest,
National, institutional, and class domination, lying in between.
But while domination lasts, it has a purpose;
A purpose which is outside its own knowledge.
And when that purpose is attained,
Domination ends.

I will endeavor to indicate why I believe that there are influences at work in the world that may free us from the domination of self-interest.

The United States of America is almost the only country in the world where freedom of speech, freedom of assembly, and freedom of the press are still officially safeguarded. We, therefore, have a great responsibility to the rest of the world to preserve these priceless "liberties" for posterity.

Because of what we have learned in the recent past we can carry on the crusade, shall we say, to "make democracy safe for the world" with far more intelligence and hope of success than in the 1914-1918 period of world conflict.

We have no time to lose for, as Paul Eliel has pointed out in his recent admirable article in the Atlantic Monthly, while we have a temporary improvement in business due in large part to "war" orders and a lessening of competition from nations involved in the destructive processes of war "sooner or later there will be international post war economic collapse" resulting from the "period of chaotic international monetary dislocation followed by devaluations of many currencies." As the article further points out, however, forced regimentation is only possible when a nation is actually at war. "Labor might be willing to be conscripted to die for an idea; it is not willing to live for private profits."

Isn't our problem, then, one of discovering how to motivate our existing economic order around the principle of incentives to effort that are other than financial? William James' moral equivalent of war, perhaps?

Because so much of our national activity is industrial, where else but in our manufacturing establishments can we so well educate our citizens as to the economic consequences of their actions, especially as related to their fellow human beings?

There is, perhaps, no more subtle medium through which to arouse interest in creative work than the economic medium. We must first rid it of much of its superstitious worship of its own symbols by setting up our accounts only after realistically determining operating and managerial responsibilities.

The workman when he is furnished with information measuring the quantity of his output becomes interested. He is even more interested in a progressively accumulative record of the quality of his work. We have as yet, however, done little more than make a start in recording the economy of his operation.

Many of the "reports to job holders" fall short of their objective because workmen have little familiarity with the "language" of accounting. To teach them this language we must start with the cost elements of the individual job. This is not difficult for costs consist mainly of three simple elements—labor, materials, and a charge for the use of machinery and equipment.

When individual costs are impractical to keep, group or department costs can be kept and, of course, plant costs are always available.

In plants, where costs of production are shown to those responsible, interest is invariably aroused and a progressive reduction in cost takes place. It is not necessary to "bait" men to increase their economy of performance by the use of financial rewards. In fact, it is far better to develop such a feeling of confidence in the management that the workmen know their compensation is in accordance with the best interest of the organization considered as a whole.

This educational work is a slow process but it is well worth the effort for nothing is so important as the establishment of satisfactory human relationship based upon mutual confidence. This can be brought about only if the employes are rendered immune against the bad effects of economic political slogans unrelated to the facts of life as they really are.

(Please turn to page 176)

The Taylor System in Europe

By C. BERTRAND THOMPSON
Management Counsel, New York

THE spread of the influence of a new and revolutionary system of ideas, such as that initiated by Frederick W. Taylor in the domain of organization and management, is a function of several variables of which the more important are the initial force of the ideas, their concrete embodiment in persons and institutions, distance and time. The dynamic force of Taylor's ideas is proved by their spread within a third of a century from a small group of engineers in Philadelphia to an almost world-wide body of engineers and directors throughout America and in many parts of Europe and Asia. No such expansion would have been possible however unless these ideas had been embodied in institutions and persons. Taylor was able to train a group of assistants and associates not only in the guiding abstract principles but also in the definite and concrete methods which in their ensemble constitute the "Taylor System." The System has served and should continue to be made to serve as a symbol, or if you like, an ideal and a model without which the principles tend to dissipate into an ever less intense influence and "spirit," as has to a large extent already occurred. This distinction between the Taylor System and the Taylor spirit must be kept clearly in mind.

In the nature of things, the Taylor System could be extended beyond its origin only by the persons who were practically familiar with its forms and mechanisms and capable of incorporating them in such individual plants and concerns as wished to use them. From this point of view the extension of the System was limited by the number and the dispersion of these personalities. The number was small and most of them have remained in the United States. This review must necessarily deal chiefly with the activities of the few who have spent a considerable part of their professional life abroad. It is hoped that this will be accepted as an excuse and apology for its somewhat first-personal appearance.

The diffusion of the spirit of Scientific Management, while it was aided greatly by the spread of the Taylor System, was largely effected by legitimate propaganda in the professional and technical press, in books, in schools and colleges, and on the lecture platform. This propaganda has continued in ever increasing volume from the beginning until now. For various reasons however the discussion has dealt more with principles and spirit than with the methods. Inevitably as the number of those talking and writing about Scientific Management has increased, the principles have become vaguer and the spirit more tenuous, until now they are taken to cover every supposed improvement in managerial practice. I have myself seen the installation of an adding machine, or even of a telephone, referred to as "Taylorization."

At the same time this diffusion has been accompanied by a vast increase of "Taylorizers," professional organizers who promise to guide their employers up the primrose path of easy organization to the rosy arbor of magical results all in a period of three to nine months (when they cannot get a contract for a year). These men take some detail of modern organization which can be quickly and inexpensively installed, and even sometimes do get quick results, though such results are rarely permanent and such isolated methods are often applied in a manner exactly contrary to the intentions of Taylor. Today, the name of Taylor is widely known throughout Europe; but his principles are more often honored in the breach than in the observance. (I may as well say at once, that this article is written from the point of view of a partisan of the simon-pure Taylor principles and methods.)

Before 1918 there were three "graduates" of the Tabor Manufacturing Company, an Englishman (Allingham), a Frenchman (Duram) and a German (Seubert), trying to develop the Taylor System in their respective countries. In England the effort encountered the almost invincible conservatism of the British temperament and was so emasculated that when I first saw some so-called examples of the Taylor System in England in 1922 I could not recognize them. In France M. Louis Renault thought he wanted the System in his automobile plant but his conception of its spirit was fundamentally different from that of Taylor; and he imposed such modifications in the details of practice, particularly on "the human side," that Duram's work

was practically nullified and was followed by a series of strikes which gave the System a bad name with organized labor. In Germany Seubert soon went into a manufacturing business of his own and confined his work to his own concern. One side of the Taylor System, however, was introduced to Germany by Mr. Gilbreth and when I went there in 1926, I found the System generally identified with time and motion study.

The propaganda for the principles of the Taylor System was well underway by 1918. Taylor's "Shop Management," "The Principles of Scientific Management" and "On the Art of Cutting Metals" had been translated entirely, or in part, into all the principal European languages and so had Mr. Sanford E. Thompson's "Concrete Costs" and some of Gilbreth's books, as well as my own compilation of articles on Scientific Management. By far the most distinguished and effective protagonist was Prof. Henri Le Chatelier, whose influence in France was great. In Germany, Prof. Schlesinger and Mr. Wallichs published articles on the subject, and Seubert wrote a book on Taylor practice. There were scattered articles in English, Italian and Spanish reviews. Most of these publications, with the exception of Seubert's, dealt more with the principles than with practice and confined their attention almost entirely to technological improvement of details by scientific methods, as exemplified in "On the Art of Cutting Metals."

The System as we knew it in America was, with the exceptions noted above, unknown. Le Chatelier in France and Schlesinger in Germany were being consulted by leading progressive concerns and both were training disciples in their methods. But their work was confined to the amelioration of processes with some use of time study and with large reliance on quasi-laboratory investigations.

The Movement in France

In 1918, as ever since, France was in the lead in its appreciation and understanding of Taylor and in eagerness to apply practically his principles and methods insofar as it was possible to learn what they were. This is shown by the order issued in February 1918 by Clemenceau explaining in some detail the principal elements of the Taylor System and requiring their introduction into all government departments and activities including the vast war industry. It was not surprising to find, however, when I was asked early in 1918 to undertake this work in munitions plants, that Clemenceau's order had remained practically a dead letter. One engineer only, a pupil of Le Chatelier's, was engaged in a study of the methods of packing the explosives manufactured in a powder plant. Obviously, the job as seen by Clemenceau was utterly beyond the capacity of one man. It was immediately narrowed down to the organization of shell-charging plants. And after a few weeks' investigation it was admitted that the only practical way to make progress was to organize one single plant and use it at the same time as a training school for organizers for the others. This method was followed at a great works at Montluçon until the Armistice on November 11, 1918. During this time a beginning had been made and a number of young officers and engineers had been effectively interested in the subject, to which some of them afterwards devoted all their time either by themselves or as my assistants.

During this same period I had given a series of lectures on Scientific Management at the Conservatoire Nationale des Arts et Métiers with former President Millerand presiding, and also one before the Société des Ingénieurs Civils, which were published the following year.

Immediately after the Armistice a number of leading concerns expressed a desire to have the System installed in their plants. I had been assured by de Fréminville that "there was no chance for the Taylor System in France" because as he thought, French directors would not have the perseverance to put it through. At the same time, Le Chatelier told me that while the directors could be counted upon both for perseverance and intelligence, the labor unions, especially the very radical Confederation Générale de Travail, would oppose it. I found both predictions incorrect. Nowhere in Europe, or America, was there a group of industrial and commercial leaders more aware of the interest and value of the Taylor System, or more willing to put their energy, authority, time and money into it than in France; and until 1936 the attitude of organized labor was that of non-intervention—as Jouhaux and Merrheim, Secretaries of the General Confederation and Machine Workers Union respectively, had promised me in 1919 that it would be.

During these twenty years, Taylor's methods in their entirety, with only such modifications as were necessitated by the special conditions in each concern and by normal progress, have been applied in machine shops making various products, and in the manufacture of rubber goods, automobile bodies, paper, beauty products, clothing, ceramics, and many other articles. They have been developed in certain branches of railroading,

including clerical work, stores and materials and classification yards. They have been applied to department stores, mail order stores, chain stores, and wholesale distributors with results to which there is no American parallel.

At the same time, a very considerable corps of general organizers and of specialists in some detail of organization has been developed and is now working either as professional consultants, or as heads or employes of the organization department in individual concerns. Some of these men and one woman have had conspicuous success in carrying on the pure Taylor tradition.

In the meantime a considerable literature on Scientific Management has grown up. Besides my own books, I have had published in France translations of Gantt, Going, Tarbell and Clark. Some of my assistants have also published excellent works and to these must be added the books by pupils of Le Chatelier and many others less closely connected with the movement but greatly interested in it and at least literarily informed.

In addition there have been innumerable articles in technical magazines such as *Outillage, Science et Industrie, Chimie, Revue de Metallurgie, Bulletin* of the Société pour l'Encouragement de l'Industrie and the *Bulletin* of the Société des Ingénieurs Civils, as well as in some of the reports of the Government Inspection de Travail.

In addition to these already mentioned, there have been lectures before the Syndicat des Industries Métallurgiques at Lyons, the School of Commerce at Strasbourg and the Chamber of Commerce in Paris, by myself, and courses or individual lectures at the Higher School of Business in Paris and under the auspices of the Société Nationale de l'Organisation Française.

In view of this, it will be readily appreciated that in no other country in Europe is there such a widespread knowledge of and interest in the Taylor System as in France. Not even the statement of a former President of the Taylor Society at a dinner in Paris in 1930 that "the Taylor System does not exist in America" was able to stop or retard this movement.

Naturally this interest has called forth a large number of "organizers" in France and brought others to its shores. But none of them has applied the Taylor System in its entirety and the great majority have had neither practical acquaintance with it nor even a clear understanding of its principles and still less of its ethics. The wider it spread, the thinner it got. One well-known company which has had innumerable branches in the United States, France, Germany, Italy and England, specialized only in time study and premium systems. As one of their clients told me, "if they had found my machines bolted upside down to the ceiling, they would have left them there and time studied them just the same." They have, however, an extensive organization and until the time of the Armistice were to be found in many government administrations and particularly in munitions plants. Another American practicing a different speciality of the Taylor System had also developed a considerable clientele but I am afraid that his work also suffered from over-extension, though undoubtedly many clients derived benefit from it within its limits. There were many other organizers in France whose acquaintance with the Taylor System was limited to its principles more or less well understood and who set about to rediscover the Taylor System in their own amateur fashion. Some of these men are leaders in the Société Nationale de l'Organisation and had influential friends in Government circles. About the only harm they did was to keep better men out. And finally there was a large group of shameless fakers, mostly unemployed bookkeepers, who solicited clients from house to house and got quite a number of them at bargain rates. Unfortunately the harm these men did lives after them, in the wide distrust of all modern organization which they left in the minds of their misled victims.

Other European Countries

I propose now to review rapidly what has been done in other European countries. My knowledge of some of them is less intimate and this survey will therefore be more sketchy and incomplete but I trust not inaccurate so far as it goes.

As to Germany: In 1926 I found that, as noted above, several books and many magazine articles on the Taylor System and its principles had been published and a considerable number of consultants were professing to apply them in industry. With the exception of one firm, however, they attempted only partial and one-sided applications; and the firm referred to had acquired its knowledge of the System entirely from the literature. The work of Gilbreth seemed to be better known than that of Taylor.

My own efforts were concerned chiefly with one of the large plants of the A.E.G. and with a leading machine tool manufacturer well known in America. Both companies developed faithfully, though not always intelligently, those phases of the System leading up to the time study. Before beginning time study I put the ques-

tion of bonus payments and met on this score the irreducible opposition both of the directors and of the labor unions; and as I refused to establish tasks without the guarantee of supplementary payment to the worker, my work stopped at that point.

The German labor organizations had collective agreements in each industry which provided not only for uniform payments in all plants for the same class of work, but also forbade the use of premium or bonus systems. Their leaders explained to me that this was partly the result of their own unfortunate experience in some cases, and was also imposed by the employers; and they could not be induced to change it although some of them were in principle not opposed to differential payments. On the other hand, the employers had an agreement between themselves by which all work was to be paid at the same rates in all their plants; and while my clients were disposed to depart from this practice they said they were unable to do so as the payrolls of all plants in the agreement were checked weekly by their central organization.

So far as I know the only other American organizers working in Germany were the firm previously referred to as practicing only time study. This concern opened an office in Hanover, but I understand did very little business. Its director, however, became persona grata with the leaders of the Nazi Government, and in conjunction with Ley of the unique labor organization, and Von Ribbentrop, arranged the famous study-tour of the Duke of Windsor in Germany a few years ago.

On the propaganda side, Professor Schlesinger was continuing his lectures at the Charlottenburg Higher Technical School; and I learned from a young lady, who apologized to me once for being a competitor, that the Taylor System was discussed for a week or two in a course which she had taken at Heidelberg University.

In Italy, the Fascist Government takes a considerable interest in modern organization and maintains an institution known as E.N.I.O.S. which publishes a regular bulletin on the subject. Their practice, however, rarely goes beyond the paper stage for a reason which I shall explain later in the discussion of the probable future of Scientific Management in Europe.

In Italy again the same time study merchant referred to above was very active for a short time. He enlisted as President of his Italian company the President of a famous automobile concern. He was thus assured an entry into that company and the many others in which the President was interested. Everything went swimmingly until the workmen's organizations all over the country began to protest, and after investigation the Government decreed the suppression of the Italian organization. In the meantime another American organizer granted to an Italian firm of accountants the license to use his methods, but I have no information as to how far this got.

In England the same time study wholesaler has operated on a large scale to the apparent satisfaction of his clients, although at the time of the Duke of Windsor's American study-tour—which never came off—he was reported to have withdrawn from the company. Sometime in 1934 the Trade Unions brought a test case against the use of his time study methods on the ground that they injured the workman in health and seriously disturbed him mentally. The court decided against this contention. To the best of my knowledge this opposition was not followed up by the Unions, and today these methods are widely used in industrial and commercial concerns in England.

There is not much to be said about the smaller countries on the Continent. An engineer who was in some relation with the Tabor Mfg. Company worked for some time in Belgium but apparently without much success. The best work there was done by Landauer who made a successful application of the Taylor principles in the textile industry and who unfortunately died two or three years ago. Poland has shown considerable interest in what it understands as Scientific Management and has produced a considerable literature on the subject. Its chief partisan was Mr. Adamieczki who once assured me that every Polish engineer was well acquainted with the Taylor System and was practicing it daily. Under the circumstances I took his word for it. It is true, however, that Mr. Wallace Clark installed the Gantt charts in many Polish concerns.

The other countries in Europe have little or nothing to show in this connection. The case of Switzerland is somewhat special. Geneva was the seat of the International Institute for Scientific Management, a coordinating center for information and propaganda. This Institute did some good work especially in the publication of Reports on the organization of outstanding concerns prepared by members of its staff. Its expenses were heavy and its membership at one time quite large with the inevitable result that the Taylor System was represented rather more in the spirit than in the practice.

Russia also presents a special case. Even before the advent of Bolshevism Russian engineers were at least curious to know what the Taylor System was about and

had some information on the subject through translations. In 1921 and again in 1935 I was approached by representatives of the Soviets with a proposition to work in Russia. For many reasons I declined it. In the meantime the Stakhanovitch driving movement had won the support of the Government and was being as rapidly extended as the Russian temperament permits.

Most engineers with practical experience of Russian workmen, whether in Russia or among refugees abroad, will agree that they are with difficulty subject to industrial organization or training. So far as modern industry and commerce are concerned the Russian people are still backward and in the mass they show no aptitude for mechanical or repetitive work nor for intelligent co-operation. Their taste for initiative, if it ever existed, has been effectually suppressed by the Soviet practice of correcting all mistakes of judgment by a flash from the firing squad. It is doubtful whether Scientific Management will ever flourish under such conditions.

International Congresses

In the period from 1924 to 1935 there were held a number of Scientific Management Congresses, in Prague, Brussels, Rome, Paris, Amsterdam and London. At these Congresses delegates from America and Europe came together to get acquainted and to discuss management matters and problems. Many interesting papers were presented and discussed. High enthusiasm was maintained especially at the early meetings and always a good time was had by all. It is to be feared however that the curve of intensity of interest in the Taylor System descended rather rapidly at the last few Congresses. Study of practice gave way more and more to discussion of principles. Scientific Management became more and more etherealized until finally in 1938 the ghost went west to Washington and, at least so far as most of Europe was concerned, quietly expired.

Turning now to the future, what are the prospects of the Taylor System in whatever may be left of Europe when this war is finished? There is no doubt that while it will be needed more than ever, there will be great obstacles in the way of its extension. In the first place, industry and commerce on the return of peace will have to be rebuilt from scratch, handicapped by a scarcity of raw materials, a rarity of factories and tools adapted to peace production, a flood of unemployed returning from disbanded armies and demobilized war industries, a prostrate foreign trade, and an unpredictable but certainly unpleasant financial situation. This will be true not only of Europe as a whole, but unless long-sighted steps are immediately taken, also of the United States and the Americas. Needless to say such a field is not propitious to the cultivation of Scientific Management, which demands confidence, stability and a peace-time mentality of unhurried and systematic progress.

In addition to these general considerations, each of the major countries abroad has special characteristics which will influence the movement. In England, for example, while the inertia of the British business temperament has thus far been an obstacle, on the other hand the extreme development of monopolies in that country has facilitated at least the partial application of Scientific Management in the few cases where the leaders recognized its utility. It is possible that under the stress of circumstances this inertia will be reduced; but it is also possible that if the war goes on long enough, the monopoly grip will be weakened and organized labor will have a much more effective influence in economic policies. Thus far the Trade Unions have conspicuously lacked enthusiasm for modern management, and it cannot be said that the general level of understanding of their present leaders offers much guarantee for the future. But again, the war may bring up a new and more progressive leadership which may not disdain to learn from our American experience. In that case the Taylor System in England may have a better chance in the future than it has had in the past. Incidentally, it is curious to note that in England Scientific Management has been transformed into "rationalization," and to the British "rationalization" means monopoly organization.

The totalitarian regime in Germany and Italy and their satellite States offers a special problem, which is different in the two countries. The Italian, notwithstanding eighteen years of Fascism, is still somewhat the same easy-going, skeptical and individualist personality that he has always been. He can be regimented into uniformed parades, his newspapers can be standardized and he will continue to shout approval for every gesture political and military of the Government, but he cannot be made to follow wholeheartedly orders which he does not like, nor induced to work very hard either by order or persuasion. There is, therefore, not much to be expected in Italy.

The German is different. He is, in the mass, credulous by nature, on the average he doubts his own intelligence, and in consequence he is sincerely and whole-

heartedly obedient. He accepts cheerfully being told what he is to think, to feel, and to do, and he will execute a misunderstood or stupid order as willingly as any other. It would seem therefore that if, as is not impossible, he were to receive the order to apply the Taylor System, he would do it to the best of his ability. But unfortunately the Taylor System is not a system which can be installed on order nor can it thrive under a regime of blind obedience. Without the willing co-operation and intelligent initiative of employes and management together, we know from experience that Scientific Management, as we understand it, cannot thrive. But in Germany, it has been and still is understood otherwise. There the emphasis is on technological improvement, better mechanical and chemical processes, to the exclusion of the human element. Their ideal, which they often confuse with the Taylor System, is the Ford organization, minus the bit of humanity that exists in the latter. The "genius for organization" for which astute propaganda has made Germany famous means nothing more nor less than totalitarian obedience. Its effectiveness, at least in war, has been demonstrated; but one may doubt its permanence in a world in which democratic ideals will have survived.

The prospects for France are more difficult to evaluate. No one knows at the present time in what shape France will emerge from the War. It is possible that Hitler still adheres to his announced program of total destruction of the hereditary enemy. It is not so clear that he will succeed in that, as there are still forty-five million patriotic, intelligent Frenchmen in France, and a whole Empire besides, who are determined to survive; and their co-operation with Hitler will go no further than the integrity of their tradition, their ideals and their country will permit. Even if under the shadow of Nazism they are or may be temporarily eclipsed, it is certain that in time, in a few years or in many, France will be France again, with its character reforged in the fires of defeat and oppression. When that times comes France will be again as it always has been, the most promising field in Europe for the understanding and application of the democratic and scientific principles first incorporated by Frederick Winslow Taylor in what we know as the Taylor System.

Labor and Management Under the Defense Emergency

(Continued from page 167)

labor's protection, and largely through labor's own insistence, then naturally labor is going to demand that management tidy up quite a bit and make its own contribution in the common effort and the public welfare—a contribution that can be vastly more significant than any which labor can make.

If American industry girding itself for war-time production can be led to adopt the techniques of scientific management and in so doing draws on labor's capacity to aid management and labor makes good on its expressed willingness to co-operate, the defense program will take on quite a different—and more promising—aspect. In fact such a partnership; i.e., union-management co-operation on a nation-wide scale, is the only and at the same time sufficient answer to totalitarian efficiency.

An even more significant statement can be made. While the democratic peoples of the world dread enslavement and are struggling mightily to avoid it there is no clear picture as to what will ensue if and when the totalitarian powers are checked. Production is the answer to most social ills—local, national and international. A picture of ordered production on a vast scale here in the United States effected through close collaboration between owners and workers will intrigue a world heartily sick both of war and of petty bickering in the field of human relations.

Non-Financial Incentives

(Continued from page 170)

It is now apparent that this immunization cannot be accomplished by the use of equally meaningless slogans such as some of the sign board posters occasionally put out by employer associations.

Management's greatest strength lies in its ability to use factual data pertaining to its business. It needs simply to present these facts in an understandable way and the power to sway men through meaningless but clever oratory will be gone.

As employers we are in position to add much of value to human knowledge and, in so doing, to the creation of a finer civilization. This "factual wealth" is far more important to possess than dollars, so why not create incentives that will stimulate a desire to acquire it?

A Quarter-Century of Public Administration

By JOHN M. GAUS
Professor of Political Science, University of Wisconsin

TWENTY-NINE years ago, in October, 1911, a conference on scientific management was held at the Amos Tuck School of Administration and Finance at Dartmouth College under the leadership of its Dean, Dr. H. S. Person; and among the speakers was one, Dr. Frederick Cleveland of the New York Bureau of Municipal Research, who discussed the application of the new ideas of management to government. Both men are still with us, and readers of this Journal know Dr. Person's continuing interest in the analysis and discussion of problems of public administration. Another early exponent of scientific management, Morris L. Cooke, served as Director of Public Works in the Blankenburg Administration in Philadelphia, and also happily continues to contribute to our store of knowledge of public administration. We are thus able to turn to a few, at least, who were pioneers in the study of scientific management and yet are participants and witnesses in its joining with other currents which go to make up the present flow of practice and ideas.

Are there aspects of the application of ideas of scientific management which are peculiar to public administration? For much of the area of governmental activity, for many of the subject matter line agencies, the management problems are so similar to those found in what is called, perhaps now inaccurately, "private" industry that there is little point in making even a verbal distinction. It may be argued, in fact, that with the growing interdependence of our institutions and procedures public and private business intermingle if not merge in the nature of their problems of organization and procedure. We may well recall the fact that some of Taylor's work was related to navy yards and arsenals; and that the opposition of groups expressed through legislative bodies could be paralleled by the opposition of groups through boards of directors. Taylor, indeed, seems early to have arrived at a practical grasp of what Veblen was to delineate as a contradiction between "the engineers and the price system." But with all the similarity, if not identity, there still remains as well a certain difference in scale, perhaps, or in the variety of the factors to be considered.

The scale and varieties of government activities create a problem of administration which makes it different from that of private organizations almost in kind as well as in scope. For behind these activities are a great number of interests, favorable or opposed—sectional, vocational, partisan, factional—with opportunities to seek political power through a constitutional representative system of government. Management must therefore operate not only within an environment which includes the influences of the price system, but also within standards, objectives and policies that have been set in constitutional and statutory provisions, and that are currently interpreted by elective legislatures and the party and other groups which influence them. At many points in the line of organization, therefore, management must be alert to the relation of a measure or a policy to these factors; and the minimum safeguards of a civic nature, including those applying to the recruitment of personnel and the expenditure of funds, as well as the refinement of policy through rule making, must be kept in mind.

Reference here made to personalities, on the one hand, and the fact of scope, variety, discretion and policy as characteristic of public administration in modern times, on the other, is deliberate. A well-knit group of disciples who have a sympathetic insight into the ideas which they share and yet retain a tough-mindedness in appraising and developing them would seem to be indispensable to the survival and influence of new ideas. Bentham and the utilitarians illustrate the point, as, on a smaller scale, did the Fabians earlier in the present century. The significance of the new problems of administration was generally missed, except by a handful of pioneers, until groups formed—notably the New York Bureau of Municipal Research and the governmental research group, or the La Follette-Commons group in Wisconsin, the Brookings group in Washington, and more recently the Chicago group. The approach to a new public administration touched the general scientific management movement through Person, Cleveland, Brandeis and a Boston group that included Dennison, Valentine, and Tead. Thus the new American Society for Public Administration may serve usefully to give continuity and stability to the

search for and diffusion of new ideas in administration.

The problem of mobilizing national resources in the World War first dramatized on a large stage fundamental aspects of an administration that had not yet been recognized or created in the United States. A direct illustration of this is supplied by the War Industries Board, since its inevitable duty was the determination of priorities, and that is the essence of planning. What is less widely known is the recognition by President Wilson of the need of the Executive Office of a regular "conspectus" of the activities and plans of the operating agencies of government and his use for this purpose of the Division of Planning and Statistics. Significantly enough, according to its head, Edwin F. Gay, the term "Planning" employed in the title was due to the suggestion of Dennison (who was to serve twenty years later on the National Resources Planning Board), and who thus first introduced it into the organization of the national executive.

If on the surface of things any consideration of the rôle of planning and of management problems generally, in a Taylor sense, would seem to have been lost in the twenties, nevertheless piecemeal advances and inventions occurred. A Budget Act was passed, although its implications were not to be explored and developed for a long time; a Classification Act gave a basis for a personnel system. Most significantly, the Classification Act was in great measure due to the action of the National Federation of Federal Employees, and its able leader, Luther Steward. Later, a general development of officials' organizations took place, under the stimulus of the new Public Administration Clearing House; these, and more recent organizations such as the American Federation of State, County and Municipal Employees are, with their secretariats, increasing the number of people seriously interested in problems of administration, supplying them with excellent materials on these problems, and what is a notable advance from forty years ago, offering points at which practical activity can be mobilized. Thus they give promise of supplying the continuity and stability to a body of ideas and methods concerning management which, if limited only to a coterie of narrow partisans, might otherwise be lost. There is a balance of interests and attitudes among these groups that reflect both older movements in government research or social policy and the newer organizations that is productive of healthy debate which should prevent too in-grown a recruitment of personnel and ideas. Even the universities have bestirred themselves in the past twenty years, and while a better informed appreciation of administration is still largely confined to some in the departments of political science and of the other social science departments, a beginning has been made in interpreting more adequately the evolution of our political institutions and problems, and in recruiting new workers in the field.

Many of the currents of influence and thought have converged in recent years in the work of the President's Committee on Administrative Management, the Executive Order on the Executive Office of the President, the President's Committee on the Improvement of the Civil Service, and the development of new programs of management research and operations in the Bureau of the Budget and the United States Civil Service Commission; they are felt also in the groups of officials mentioned above, such as the Civil Service Assembly, the International City Managers' Association and many others. Studies in administrative law, such as those of Blachly and his associates at Brookings and Gellhorn of the Department of Justice illustrate the same new tendency. But in any balanced account of the growth of management studies in government one must now note the development within departments, and within bureaus and smaller units on all levels of government, of more conscious attention by operating officials not only to subject-matter problems but also to problems of organization, procedure, personnel, public reporting and the other auxiliary and general staff services. A rapidly growing literature on these developments, including some reference to comparable problems abroad (such as the recent study of German administration by Brecht and Glaser) now almost overwhelms the student who would keep abreast of the field.

It is at this point, indeed, that a difficulty confronts us. How are we to absorb and evaluate the developments that are taking place, especially in a setting so characterized by unprecedented and rapid social changes? How can these problems, and at least tentative lines of attack and solution, get interpreted to a larger number of laymen, and groups interested in accomplishing purposes through public administration, who may wreck the hopes for a successful program through neglect of instruments and procedure? Will not students of management have to give greater attention to problems of legislative organization and procedure, and behind the legislative process, to general adult education among the interest and civic groups?

Perhaps the earlier history of the scientific movement as applied to industry in the narrower sense provides

a clue, since the earlier gap between those concentrating on procedures in the shop and those interested primarily in the labor movement has to some degree been bridged. Somehow those of us interested in management must share experience and study with fellow citizens intent on the development of social policy through government far more than in the past. The concern over technical advances in Washington, let us say, may find disappointment because it lacks relation to the attitudes and outlook of men and women in remote farms, villages or industrial districts. It is a gulf that cannot be bridged alone by the efforts of the most clever public relations counsel. We can find new suggestion here for advances in management from experiments in interest group representation of the N.R.A., the A.A.A., and many other agencies, or the techniques of consultation employed by the T.V.A., the Leagues of Municipalities, and the inter-level co-operation in housing, social security and planning. Some day, too, we shall again make use of the contributions of Americans in international administration.

Slowly the idea of administration as being a major aspect of government, and government as something other than a kind of racket and spoils, makes its way among more people despite the clash of groups and the necessary struggle of parties. Is that movement too slow? The first of the general texts, for example, did not appear until the mid-twenties. The conception of government as essentially a negative force has long since been belied by the facts, yet is still accompanied by widespread attitudes of distrust, and effective devices of measurement available to the voting public are still to be invented. The students of public opinion and of political attitudes give us sometimes almost terrifying glimpses of the difficulties that attend upon a wider understanding of the working problems of legislation and administration. Apparently, too, we shall have to operate within a society undergoing even greater shocks and challenges than in the past, and thus less receptive to the kinds of education which have already proved less than adequate in so many places at so many times.

Nor is this all. Even within our own province of reorganized administrative agencies, how frequently is there a gap between the staff and auxiliary units and the operating line units! How much of our achievement is a paper achievement, the expression of proposals and policies that seldom reach down effectively into the field, the local unit, so as actually to change the conduct of an office in its relation to the citizens it is supposed to serve! There is healthy scepticism as to whether the principles of organization and procedure, of classification, for example, as embraced in one decade are really supportable principles for another. The proliferation of management agencies may bring a great weariness and cynicism rather than a facilitation of getting a substantive purpose better accomplished. New devices and agencies are too infrequently fitted nicely into effective operations, or an improvement of the work of the executive. And will time be given to our institutional system and its values to work out improvements? The fate of advances in public administration is inescapably mingled not only with technical studies and practices in all institutions but in social policies generally, and in a better understanding of human nature.

To note these questionings, however, is a reminder that we are participants in a frontier activity, which like our own nation, is still unfinished. Such a challenge is a preventive of a too-settled outlook, a routineer mentality, that is the curse of a vocation. It explains why one can find such satisfactions among one's colleagues in the field.

One who first became acquainted with this field in 1915, while not indulging in easy optimism in the world of 1940, does take renewed strength in finding so many of his old-time guides and friends still actively at work, and so many new recruits; and concludes, as he surveys a quarter-century of development of management in government, that there is much more that is creative and suggestive than is appreciated generally. Here is a great task of interpretation for students of administration, which makes them indispensable in shaping social change.

Scientific Management and the "Cultural Lag"

By MARY B. GILSON

Associate Professor, Department of Economics, University of Chicago; formerly, Employment Manager, Joseph and Feiss Company

WHY was it that during the war of 1914-18 "organized labor observed that those holding the scientific management doctrine were the most consistent of all employing groups in regarding and promoting labor's interests and in desiring to conserve labor's gains after the war"?[1] I believe it was because management which was truly "scientific management" regarded healthy and just labor relations basic and essential.

It would be superfluous for me to describe in detail to the audience of this journal, the many advantages scientific management holds for workers in its potentiality for increasing wages, reducing hours, reducing unemployment and unemployment within employment, reducing fatigue, furnishing opportunities for individual capacities by better selection and training, not to mention the great service it performs in reducing the countless irritations and frictions which result from poor management.

It would be equally superfluous for me to go into detail concerning the many pitiful examples of ineptitude which have masked as "scientific management" and have too often deceived the uninitiated, unable to distinguish the original from poor imitations. They would not have been so easily deceived if they had examined Taylor's underlying principles:

1. The development of true science.
2. The scientific selection of workmen.
3. Their scientific education and development.
4. Intimate friendly co-operation between the management and men.

In "Hearings Before Special Committee of the House of Representatives in 1912" Taylor emphasized the importance not only of a complete mental revolution on the part of workers but "an equally complete mental revolution on the part of those on the management's side,—the foreman, the superintendent, the owner of the business, the board of directors . . . without this complete mental revolution on both sides scientific management does not exist."

[1] Harlow S. Person in *Scientific Management in American Industry*, Harper and Brothers, New York, 1929, page 19.

In 1913 I heard Taylor deliver a series of lectures in Boston. In those lectures as well as on subsequent occasions when I discussed labor relations with him personally he emphasized the greater duty of management in assuming responsibility for the installation of scientific management built on the concept of "intimate friendly co-operation between the management and men."

Now I maintain that just as in international matters we have allowed stresses and strains to come about because we have not built up judicial machinery for the study and adjustment of these inevitable stresses and strains, so in the industrial world we have been neglectful of constructive measures for handling stresses and strains. We are witnessing the tragic results in both cases. At the door of management I am inclined to lay the blame for not having achieved more "friendly co-operation" with workers, for employers in general have had more opportunities and advantages than workers in general. Moreover, they have been slow to accept the offers of co-operation on occasions when leaders of labor have expressed an interest in union-management plans for collaboration in improving methods of production.

Sociologists and psychologists have pushed back the frontiers of knowledge since Taylor's time and were he alive today he would undoubtedly have profited by their contributions. For his abhorrence of rule-of-thumb methods led him to avail himself of existing knowledge and to explore beyond the known. Cooley, the great sociologist, said, "I take it that the formulation of a scientific problem is designed to promote truth by summing up what has been ascertained and indicating where more illumination is needed." Yet today many industrialists are ballasted with ideas left over from an age which is past. The economic and industrial world has been growing in complexity by leaps and bounds! The interdependence of units in an industry is recognized by the growth of trade associations and other employers' associations as well as by the growth of trade unions.

But relatively few employers have yet realized the importance of *encouraging* the organization of their

workers as a means toward a more orderly society. Is this not due to what sociologists term "cultural lag"? New machinery, new methods, new combinations of capital and new industrial and economic "set-ups" come thick and fast, yet mental habits often remain fixed. Men who pride themselves on experimentation in the use of new machines and techniques refuse to observe and analyze experiments in human relations lest the findings impinge upon some of their cherished traditions. How many bulletins and journals published by employers' associations examined and recorded the progress of the Baltimore and Ohio experiment? How many employers have attempted to be objective and self-critical in analyzing the irritations and frustrations of workers which are so often an indication of poor management and which frequently result in bitter strikes and even more bitter aftermath resentments? "Peace when there is no peace" is only too often the temporary patch which satisfies the poor manager until there is another explosion.

Sociologists point out that necessity is not inevitably the mother of invention. One can quote innumerable instances of needs existing for long periods before they were met. For example, the steam engine was needed many years before it was invented. And, since inventions may be non-material as well as material, we may speak of the "invention" of scientific management and of its need long before it came to light. The use of the steam engine, of the electric light, of the automobile, of the radio, spread like wild-fire. In contrast, how slowly and laboriously does the invention of scientific management spread. And yet what a revolution in the lives of workers it would effect, if properly installed; how much less waste of materials and human energy and capability there would be!

Again let us refer to the sociologists. They tell us inventions are adopted slowly if they interfere with the "sacred." Now, unfortunately, since real and bona-fide scientific management rests on "intimate friendly co-operation between the management and men" we are treading on sacred ground in the case of many managers and owners. Prestige and power are sacred cows in only too many establishments and when a manager prefers an aura of holier-than-thou around his head, "intimate friendly co-operation" is out of the picture. He may install the most up-to-date machinery, he may have the last word in accounting methods, he may have all the latest devices and techniques in manufacturing methods, but if he has not learned how to take his workers into his confidence and how to bring out their opinions and ideas and knowledge and get their co-operation he will not have proceeded far in the introduction of scientific management.

Just as the stability of a political group rests on a code in the formation of which it has had a part and to which it subscribes, so the stability of an industrial group, engaged in the common venture of manufacturing, rests on the workers having a voice in the code or "standard practice" of their plant. A serious strike was the result in an automobile concern a couple of years ago when management refused to acknowledge that workers should have any "say" in setting production standards. If workers are too ignorant to express an opinion on matters of daily observation and concern to them they are too ignorant to vote on political affairs, many of which are far more complicated and intricate than setting production standards.

Democracy is on trial today. Government of, for and by the people must be more than a phrase if we wish to protect the "ramparts we watch." I can think of no better way to practice democracy than for management to get "intimate friendly co-operation" with workers. I do not believe this can be done without a full realization that power and prestige are ancient habit patterns which result in dangerous "cultural lags" in a fast moving age; that orderly machinery for the smooth running of human relations is as essential as is well-oiled machinery for the turning out of products; that responsible employer organizations and responsible labor organizations are increasingly important in our social structure; and that union-management collaboration is in this day and age probably the most effective way of securing that "intimate friendly co-operation" which Taylor considered so essential to authentic scientific management.

Some Observations on the Background, Scope and Significance of the Function of the Management Engineer

By HARRY ARTHUR HOPF

Senior Partner, H. A. Hopf and Company, Management Engineers, New York, and
President, Hopf Institute of Management, Ossining, N. Y.

ON THE occasion of the annual dinner of the National Management Council of the U.S.A., held at the Waldorf-Astoria on April 11, 1940, Dexter S. Kimball, Dean Emeritus of Cornell University College of Engineering, presented an appraisal of Frederick W. Taylor which he summarized in the following significant terms:

> Most important and underlying any and all of the theories and mechanisms of management that may be identified as his work, is the spirit of the man himself as the prophet of more efficient methods. Whether any or all of his specific methods survive, the spirit of inquiry that he set in motion concerning industrial methods, his frank scepticism of the efficiency or desirability of existing methods, even though they bore the imprint of hoary age and the stamp of ancient precedent, will ever remain one of the greatest contributions to the industrial arts.

This characterization of the spirit of Taylor appeals to me as affording a fitting introduction to exploration of the function of the management engineer from the points of view of its historical background, changing scope and present-day significance, for in the quarter-century that has elapsed since his untimely death, Taylor has justly come to be viewed as a prototype to be emulated by all management engineers who strive to express themselves in harmony with the highest standards of their profession.

It is logical to initiate this discussion by asking, "How did management engineering evolve?" Although no date may be assigned to the inception of management engineering, I believe that all students of the field will agree that the presentation by the late Henry R. Towne of a paper entitled "The Engineer as Economist," at a meeting of The American Society of Mechanical Engineers held in 1886, constituted one of the earliest instances of record in which the concepts of engineering and management were paired and a delineation of the influence of the one upon the other was given.

From that time on, the transactions of the A.S.M.E. contained many notable contributions by men such as Barth, Emerson, Gantt, Gilbreth, Halsey, Taylor and Towne to the field today designated as management engineering. These men, and others who could be singled out for specific mention, not alone prepared much of the foundation work through original contributions of great value, but most of them, at various stages of their careers, became active in the practice of management engineering.

By the year 1910, we may safely say that the management engineering movement had been launched, because in that year knowledge of the work and accomplishments of Taylor and his followers was given to the world through the medium of the testimony presented at the railroad rate hearings before the Interstate Commerce Commission in Washington.

The impetus supplied by that disclosure of the doctrines of scientific management caused many attempts by individuals, as well as by groups of collaborators, to establish themselves as consultants in the field. Some of these men were competent and well trained, but many possessed no legitimate claim upon the confidence of the public. It was in this period that the concept of efficiency became a watchword, but it soon lost its hold upon the public and fell into disrepute caused mainly by unethical and exaggerated claims, followed by unworthy performance.

During these years the term, "management engineering," was relatively unknown, and the comparatively small number of competent engineers who were enlarging upon the foundations established by the pioneers were not in a position to advance their professional activities to a level of general recognition and acceptance. One is tempted to speculate upon the possible outcome of the adverse influences with which management engineering would have been confronted had not the World War intervened, with its almost immediately growing

demand for competent and trained assistance in the expansion and improvement of industrial organization and facilities.

Until approximately the time of our entry into the War, the objectives of engineering in the management field were confined almost wholly to problems relating to production. As soon as we ourselves joined in the conflict, the urgent requirement for manpower on an unprecedented scale brought into focus the overwhelming importance of the human factor. At once the scope of management engineering was enlarged and the groundwork laid for more substantial recognition of the validity of its function. It was at this time that The Society of Industrial Engineers, an organization brought into being as a definite response to certain war needs, was established.

It would unduly delay the development of my theme were I to dwell upon what the doctrines of scientific management came to mean to the warring countries, especially to France, which found itself under a tremendous handicap occasioned by the loss of much of its industrial equipment, for this had been largely located in the territory overrun by the Germans. Let me, therefore, pass quickly to the post-war period and call attention to the fact that the disturbed economic conditions of that era compelled attention, as never before, to the need for more science in management and, particularly, to the necessity for the elimination of existing waste, for which responsibility was properly laid at the door of management. The work of the Committee on Elimination of Waste in Industry, performed under the general direction of the then Secretary of Commerce, Herbert Hoover, created as a by-product a renewed appreciation, in ever-widening industrial and commercial circles, of the value of the principles enunciated by the pioneers of scientific management.

Management engineers were beginning to come into their own and, while many of them failed to survive the drastic effects of the post-war depression, a number of well-established firms and individuals were faced with increasing opportunities for rendering a strictly professional service in the several subdivisions of the new profession which they were helping to develop.

With the gradual widening of the interests of management engineers, the urge was felt among their leaders to institute some form of organized co-operation. It is to the credit of Mr. E. O. Griffenhagen, a management engineer of high standing and ability, that at this time he conceived and attempted to carry out a plan having such co-operation as its objective. Under the auspices of The Society of Industrial Engineers, Mr. Griffenhagen and his colleagues conducted their discussions. While the interest manifested by the participants was keen, the ultimate outcome of their protracted deliberations was negative. Viewed in retrospect, this was due primarily to the youth of the profession and the difficulty of establishing a group consciousness with respect to generally acceptable aims and objectives. The efforts of the Griffenhagen committee were not altogether abortive, however, for they tended to perpetuate the desire for ultimate recognition of the community of interest existing among management engineers.

The rapidly expanding practices of the leading firms of management engineers, reflecting the tremendous growth of business in the years culminating in 1929, served to engross thought and energies to such an extent that it was not until the latter year that the time once more seemed propitious for reopening the subject of professional co-operation. By a happy coincidence, it was again at a meeting of The Society of Industrial Engineers, held in Pittsburgh, that a group gathered to consider the organization of an association devoted to the furtherance of its interests. On this occasion, doubtless because of greater vision and experience, the problem of organized co-operation was attacked with increased vigor and led quickly to the establishment, in the autumn of the year, of the Association of Consulting Management Engineers, comprising a small group of professional organizations of recognized standing and accomplishment. Today, a little more than a decade after its founding, this association is widely known and is exercising a rapidly growing influence of most constructive character not only in advancing the cause of the management engineering profession, but also in educating and protecting business in its relations with the profession.

Application and Scope

This sketchy review of the historical background of management engineering omits reference to many important aspects, but it may nevertheless serve the purpose of providing a limited perspective of the events of the past. Moreover, it may give point to the observation that management engineering, in its evolution, has either closely paralleled the development of management as an art and science, or, indeed, has at times led in that development. We are prepared now to define and to consider the field of application, the scope, of management engineering.

Academically speaking, one might easily defend the thesis that wherever the art of management is exercised,

opportunity may be found to apply engineering principles. In practice, however, the evolution of management has influenced engineering aspects to such an extent that they have developed largely through a series of emphases upon often unrelated subdivisions of the field. Thus, management engineering, in its application to industry and business, has proceeded not by the unfolding of a comprehensive pattern, but rather by a succession of steps which today still call urgently for integration on a broad scale.

It is desirable to emphasize some of the highlights in the extension of the scope of management engineering. In the beginning, and for years following the inception of the scientific management movement, problems of production received chief consideration. The human factor, as has been pointed out, came into focus during the period of the World War, and waste elimination held the field for some years thereafter. Paralleling the latter phase, came the development of standard costs and, with the restoration of prosperity following the post-war depression, there dawned a scientific interest in all aspects of research and marketing. Recognition should be accorded to the Taylor Society for having been the pioneer in initiating at its meetings organized discussions concerning marketing fundamentals.

This period is marked, also, by rapidly growing acceptance of budgetary procedure as an indispensable mechanism of management, and by the branching out of earlier attempts to introduce wage incentive plans, resulting in the formulation of a host of devices and systems, some of which were little above the level of nostrums.

Special mention should be made of the pioneering and brilliant work of the Gilbreths in time and motion study. While this work was rooted deeply in pre-war years, its value and significance in enlarging the scientific basis of management came to be increasingly accepted following the war. Early in this period we may place, also, the organized extension to the office of engineering principles and techniques which had previously been discovered and developed in the factory field. For a number of years prior to this time, pioneers in the study of office management had, of course, applied themselves to paving the way for such an evolution, but the establishment of the National Office Management Association in 1919 marked the beginning of a new epoch in the application of engineering methods to this important subdivision of business.

It would take us too far afield to delineate other tides and cross-currents which served to sweep forward, or occasionally to block, extension of the scope of management engineering. The unparalleled expansion of business in the second half of the nineteen-twenties presented many new points of attack, and, as a natural concomitant, problems of organization, co-ordination and control thrust themselves more and more upon the attention of engineers. Perhaps it was this development, more than any other cause, which was responsible for the gradual creation of a synthesis of points of view regarding the scope of management engineering among its practitioners. It certainly tended to induce a keener sense of relative values and to underscore the importance of weaving into a comprehensive pattern all the phases that in course of time had come to be associated with management engineering.

As a logical outgrowth, there has finally developed in recent years an interest concerning itself predominantly with scientific method and measurement, and this had led, in turn, to a broadening of the perspective in relation to the field of application of management engineering. Among more recent illustrations of this trend, I cite the movement, inspired by the chaotic conditions of the depression period, which has as its objective the extension of management engineering to consideration of economic and social problems. This implies planning on a broad scale, exceeding the limits of individual institutions, and dealing with relationships among one another of all units in an industry, and even with the interplay of forces among industries. At present we are but in the early stages of the evolution of this movement; nevertheless, it is clear that in order to acquit themselves successfully of the new responsibilities with which they are faced, management engineers will be compelled to submit themselves to a far-reaching process of re-education in terms of these new and complex implications.

Present-day Significance

We may now proceed to consideration of the present-day significance of the function of the management engineer. Whatver differences of opinion still exist among potential users of his skill regarding the validity and usefulness of his function, there is undoubtedly general agreement that it is distinctly one of *modern* significance and purpose. Perhaps it is because of this fact that there are still altogether too many organizations, large and small, which find it difficult to convince

themselves of the value of having their affairs examined by a competent management engineer.

In reflecting upon the matter and visualizing the many hundreds of business institutions in scores of different fields that have come within my professional purview, it has been strongly impressed upon me that an important clue to the negative attitude of so many business executives may be found in the fact that the type of management they are prone to exercise is of the traditional, rule-of-thumb, kind and is not, therefore, by any stretch of the imagination to be characterized as scientific. Individuals in this category are trained rather than educated; they do not possess a sufficient awareness of the essence of management to recognize that, apart from remaining in many respects an art, management has come to be fortified with a body of principles and techniques so well integrated and synthesized that through their intelligent and persistent use complete assurance may be gained for the achievement of increasingly satisfactory operating results.

In dealing with this rather widespread negative attitude, the management engineer must realize that it can best be overcome through resourcefulness and determination, dominated by a broad perspective and fortified with patience and understanding of human nature. Perhaps it will be of some assistance to him in coping with the problem presented to remember that every business institution, except the most progressive and far-seeing, will be found to number among its executives one or more individuals who conform ideally to the exasperated characterization uttered by G. Elliot Smith: "To obtain recognition of even the most trivial of innovations it is the common experience of almost every pioneer in art, science, or invention to have to fight against a solid wall of cultivated prejudice and inherent stupidity."

There is no reliable formula for dealing with such executives. Their proud boast is that their experience enables them to supply answers of satisfactory character to the problems with which they are faced. They are, therefore, inclined to reject anything that savors of newness, blissfully unaware of the fact that progress is attained mainly by opposition to the existing order of things, and that most really great achievements in the history of civilization may be placed to the credit of rank outsiders. Perhaps it will, on occasion, prove helpful in dealing with executives of this character tactfully to remind them that there are two kinds of authority which are all too infrequently encountered in one and the same individual, namely, authority of position and authority of knowledge.

If I seem to have strayed from the task I have set myself of considering the significance of the function of the management engineer, it should be explained that this aberration is apparent rather than real. Significance needs to be interpreted from two angles, that of the prospective or actual client, and that pertaining to the function itself. The latter is charged to such an extent with psychological considerations representing the interplay between the two principal parties involved in the relation of client and engineer that it appealed to me as wise to deal first with that aspect of the question. One has only to recall the difficulties that attended much of Taylor's effort to expound his principles and to apply them in the interest of clients, to recognize that psychological aspects are of preponderant importance.

Now let us look briefly at the other side of the picture. It may serve a useful purpose to define the management engineer, in the manner expressed by the Association of Consulting Management Engineers, as one who "has a thorough grasp of the principles of business organization and administration and who, because of his long and varied experience, is competent to make specific and practical application of those principles in the handling of men, materials, machinery and money, and to assist business executives to bring about better results for owners, workers and the public." Here is a definition that leaves nothing to be desired with respect to scope and significance. I must, however, insist that in practice it becomes an intensely personal problem for the individual management engineer to endow his function with the significance which, speaking objectively, may be said to characterize it.

I am proud of the profession to which I belong and to which I have devoted all of the years of my maturity. It is because of broad experience and observation that I cannot escape the conclusion that much of the significance that might attach to the function management engineers perform is vitiated by the fact that many capable practioners lack natural fitness by reason of personal qualifications to achieve genuine success of lasting quality. They are deficient in the ability to interpret themselves successfully to those whom they undertake to serve; moreover, they are not facile enough in their relations with all those stationed on the various levels of the organizational hierarchy with whom their work brings them in contact, invariably to win the kind of support required to translate their findings and recommendations into constructive action.

I have long entertained the conviction that the personal qualifications of the management engineer, among which I accord high rank to the two just referred to, weigh far more heavily in achieving success than do the technical qualifications with which he may be endowed. If he finds himself unable to accomplish the desired progress in serving clients, it is always advisable to seek first to remove the defects in his own intellectual and emotional makeup before concluding that the fault lies with the client in failing to be receptive to his recommendations.

To the management engineer who is possessed of the requisite personal attributes and comprehensive technical knowledge and experience, the opportunities for constructive service, adequate reward and more general recognition of the significance of his function, were never greater than they are today. Due to a variety of conflicting forces, many of which are of hostile character, business in America is on trial in a very real sense. The heavy hand of government is threatening to stifle individual enterprise; profit margins are being reduced, if not eliminated, by harsh measures of taxation and regulation; business executives are bewildered, disturbed and fearful of the future.

Under such conditions, the management engineer finds that those whom he is equipped to serve, provided they have the vision to believe in progress and are convinced of the validity and usefulness of his function, are turning to him with confidence in his judgment and faith in his ability to assist in the only area of action that remains available for profitable exploitation, the perfecting of the internal operation of their organizations. It is precisely in connection with "putting their houses in order" that industrial and commercial corporations are, with the trained assistance of management engineers, addressing themselves to the consideration of such controlling subjects as these:

1. The structure of the administrative and operating organization;
2. The selection, training, direction and remuneration of personnel;
3. The forecasting of demands and needs;
4. The planning of activities and budgeting of resources;
5. The collection and maintenance, in the most economical way, of the most helpful records relating to operating costs and results;
6. The establishment of standards against which to measure progress in economy, in quality and in service;
7. The improvement and expansion of features of industrial relations;
8. The utilization of intelligent research and development procedures.

Not only must the factors and elements in the technique of business management be continually adjusted to meet changing volume, trends and requirements, but they must be periodically reviewed if they are to be kept abreast of developments in the science and art of business management.

It is a far cry from the pioneering days of Taylor to the current scene amid which the activities of the management engineer must be performed. It would be comparatively easy to enlarge upon the picture which I have endeavored to paint and to push the concepts of scope and significance to horizons which would include many phases of the social and economic orders with which we are confronted. I refrain from doing this because I do not wish to employ too large a canvas for present purposes.

I cannot, however, conclude without emphasizing the long entertained belief that, if the management engineering profession is to attain the highest levels of significance, it will be necessary for it more and more to conceive its function in terms of broad, inclusive business counsel rather than within the narrow limits of specialization. For some of the older practitioners it may be too late to accomplish the drastic change implied in this statement. And so, it seems fitting in rounding out this presentation of the function of the management engineer to turn to the incoming generation of younger engineers and express the hope that they may be gifted with the degrees of vision and understanding essential to advancing the profession which they inherit along the path of enlarged service and the realization of enduring values. To members of this generation I offer the following ten-point program as representing the best summation of my own philosophy which I have thus far been able to formulate:

1. Refrain from establishing yourself independently in practice until you have reached at least the age of thirty-five years, for, with rare exceptions, no one younger has lived long enough to accumulate sufficient knowledge, experience and maturity wisely to counsel business executives;

2. Employ at least ten years following graduation in learning to understand the various functions of business from the practical point of view;

3. Yield not too hastily to a perhaps natural tempta-

(Please turn to page 191)

The Development and Influence of Scientific Management

By H. S. PERSON

Consultant in Business Economics and Management, New York

LIKE the practice of medicine, management is an art. The characteristics of the physician or manager constitute as important a factor as the availability of a body of guiding principles and of a recognized technique. Excellence in the practice of medicine is a composite result of the instinct and desire of the physician to be excellent, his ability to understand a large body of organized knowledge guiding diagnosis and treatment, and his skill in applying the pertinent treatment. A thousand students of medicine who have had precisely the same education and training will as physicians show widely divergent capacities in the practice of medicine. Scientific management has given to management generally a body of organized knowledge and a recognized technique to guide in the handling of concrete management situations; yet a thousand managers who have read its literature and visited numerous enterprises where it is exemplified will in their actual managements show a thousand different degrees of competence and a thousand different degrees and kinds of scientific management.

Consequently the nature of the development and influence of scientific management cannot be discovered and measured by the method of counting cases that at particular times fall into homogeneous groups. They do not fall into definite groups. One's judgment of its development and influence must depend rather on the cumulative effect of constant observation through many years of numerous and varied manifestations of scientific management; and the factors that enter into the formation of a judgment are more qualitative than quantitative.

Prior to Taylor, management generally was an art based on intuitive judgments and guess. To be sure, in a few spots there were managements, compelled by the force of circumstances, that we now recognize as prehistoric exemplifications of scientific management: Von Moltke's development of the planning and preparation technique of the staff function in military management; Peary's precise planning and preparation of his expeditions in search of the North Pole; in business, the planning, preparation and standardized energy and time-saving management of a circus. But no system of generalized principles arose out of these isolated experiences in management. Management generally continued to be characterized by dependence on intuitive judgment.

Taylor brought science to the aid of the art of management. As de Freminville put it, he brought the inductive method to apply on the conduct of the homely affairs of the shop. Out of this beginning has developed on a large scale, in many countries, and in respect of many phases of human affairs, an art of managing that consists of resourceful utilization of every possible contribution of the sciences—those pertaining to human nature as well as those pertaining to the physical world—in the solution of the ceaseless flow of problems that arise in management situations; in manipulating the factors that, skillfully proportioned and combined, will bring about a preconceived result with a minimum expenditure of the energies involved, and within a predetermined time.

In the experience of Taylor himself, the first years of the development of scientific management—back in the eighties—constituted a period when, so far as his consciousness was concerned, the art rather than the science aspect of management was dominant. The process of its development was to him simply a process of solving, as gang-boss, foreman, assistant engineer and chief engineer at the Midvale steel plant, a succession of daily concrete management problems.

The manifestation of his genius was this: whereas other engineer-managers—all engineers in that day were managers—left their engineering technique behind when they turned from distinctly engineering problems to management problems, Taylor instinctively and perhaps unconsciously carried his engineering technique along with him when he made the shift. But apparently for a number of years he did not think much about the significance of his method. He was intent on productivity and economy coupled with—few students yet understand this—the good-will of labor, the quest for which started him on his course. It was listening to the

discussions of management at meetings of the recently organized American Society of Mechanical Engineers—at that time almost exclusively discussions of wage systems—that stimulated Taylor to ponder over the contrast between how he was managing and how other engineer-managers were managing, and over the significance of his way of managing. The eventual fruits of this pondering were *A Piece Rate System, Shop Management, On the Art of Cutting Metals,* and at the time of the Eastern Rate Case Hearings in 1910-11, a simplification of *Shop Management* under the title *The Principles of Scientific Management.*[1]

The cumulative effect of these expositions was a world-wide interest in the Taylor principles and technique of management. The immediate translation of the *Principles* into more than a dozen languages is evidence of universal recognition that here was something new and significant. Subsequent claims of Germans that their *rationalizierung* is a parallel and independent development are cancelled by the fact that German engineers and managers were at the time of the translations as excited about the Taylor methods as were the engineers and managers of other countries. From that moment on, scientific management constituted a new and powerful sector to modern technology, exerted a profound influence on management in all advanced industrial countries, and gave to the management movement in the United States and elsewhere a comprehensive and integrated body of doctrine, principles and technique.

Scientific management has never been a thing that could be procured and installed in a particular place at a particular time, as can an engine or a loom. It is not a system that is definite and transferable in all its elements. It is rather a system of approaching and solving management problems out of which may develop in each particular management situation a system of actual management suitable for that particular situation and for no other. Of course certain mechanisms and detailed ways of doing things are transferable and are duplicated in many situations, as are lead pencils and adding machines, but too great attention to these minutae is evidence that one fails to comprehend the significance of the principles and the technique as a whole.

Some Fundamental Practices of Scientific Management

Determination of the presence of scientific management in an enterprise calls for observation and analysis of qualitative factors. It is present in an enterprise, or in a department of an enterprise, or in a unit of a department, when the following qualities are found in combination and in substantial degree of development:

The practice of attacking the solution of all problems as they arise by application of every available pertinent scientific method of fact finding; and as thoroughly as the time factor permits;

The practice of maintaining a classified record of discovered facts, of deriving from them standard objectives, methods and devices, and of routinizing recurrent activities into standard combinations of standard methods and devices, thereby leaving only the non-repetitive variables for current studied attention;

The practice, where people in a group are working under the principle of division of labor, of co-ordinating activities by providing each person an adequate understanding of what, when, how and how much in respect of each of his efforts;

The practice, where people are working in groups, of maintaining a regime of co-operative relationships, recognized as dependent on good-will as well as on understanding.

These are qualities of management of which the development should be sought in every management situation—wherever a group of people is working in co-operation to achieve a desired result. We are accustomed to identify it with management in business enterprise, but it is as applicable and desirable in any field of effort; in non-profit as well as profit and in public as well as private enterprises; in fraternal and recreational as well as livelihood activities. The principles and the technique of approach are universal, and in the quarter-century since Taylor's death—even in the half century since he first explained the principles—human ingenuity has discovered no system of management that is superior or equivalent. The contributions have been improvement of and additions to some detailed mechanisms.

The Influence of Scientific Management

Scientific management has had a profound influence on the management of enterprise in all advanced industrial countries. More in some than in others because, as we have said, management is an art and an art is powerfully conditioned in its development by racial, social, political, institutional and personal factors. In the United States, while quantitatively it has influenced only a small fraction of the industrial enterprises enumerated as such in the Census, it is found in varying

[1] The term Scientific Management was not devised by Taylor; it was devised by a committee of engineers at the request of Louis D. Brandeis, principal attorney for the shippers at the Eastern Rate Case Hearings, for use in the course of the hearings.

degree in practically all the larger enterprises that account for the major part of total productivity. The influence has been essentially the same in Germany, and on a per capita reckoning, in Sweden. Japan would perhaps rank next. In most other countries of Western Europe are found outstanding individual examples, although generally industrial managements in these countries have not been notably influenced. In Russia, while the State as the ultimate control of all enterprise has been influenced by scientific management principles and technique, notably in respect of national planning, there is little evidence that the managements of individual constituent enterprises have been substantially influenced.

The Extension of Scientific Management

Nearly ten years ago, in a paper presented in Amsterdam at an international conference of IRA,[2] I advanced the thesis that scientific management has in it a vital element that compels extension of the area of its influence after a nucleus has been established at any point. This is because its primary technical objective is stabilization—dynamic stabilization by reduction of the variable factors of a managerial situation. It had its beginning in a machine shop. But the management of a shop cannot be stabilized if relationships with its environment are unstable. One of the first things Taylor did back in the eighties, in his efforts to stabilize the operations in a machine shop, was to send instructions to the foundry in respect of tolerances in the deviation of castings from specification size. Scientific management in one shop compels scientific management in all related shops, and thus develops scientific management of the entire production department. In course of time it is discovered that scientific management of the production department cannot be highly developed if the conduct of the sales department is one that injects numerous variables into the production schedule. Consequently scientific management is compelled to reach out and include marketing within its area of influence. Also it is discovered that scientific management of production is limited if labor relations are too unstable, so scientific management has to include personnel management—the management of labor relations—within the range of its influence. Taylor set up the first functionalized personnel management. And inasmuch as any one of a group of co-ordinate functions or departments cannot effectively control and stabilize the others, it is eventually discovered that it is necessary for scientific management to reach up from the operating departments to the level of general administration and organize the latter as the co-ordinating and controlling agency of the entire enterprise.

This compelled expansion of scientific management stabilization and control does not stop with the individual unit of enterprise. In a horizontal or vertical integration of related units under a common ownership and direction, scientific management cannot be highly developed in any one of them unless all are brought within the system. There are evidences that this principle applies even when related individual enterprises are not under common ownership and direction; the development of hand-to-mouth buying has so influenced the relations between retailer and manufacturer that they in many instances have had to work out in advance schedules of orders and the flow of goods from one to the other. Given a nucleus of scientific management anywhere, in the course of time its influence will reach far out into what was to the nucleus originally only environment.

In expression of this principle of ever reaching out to include more of its environment within its system, scientific management appears to have encountered insuperable obstacles in promoting scientific management of entire industries. Attempts at stabilization of entire industries have been made along the line of agreements among enterprisers as to certain competitive objectives, and not along the line of revisions and co-ordinations of the managements and the relations of the enterprises party to the agreements. Whereas scientific management tends to reduce costs and pass the benefits along to consumers, and in that way to integrate technology into the social system and preserve the dynamic characteristics of an economy, the method of stabilization through agreements tends to retard integration of technology into the social system and to debilitate an economy.

I take it that scientific management has encountered this obstacle because its development must be guided by a single directing mind or by an equivalent in an institutional mind. The individual enterprise has this; the establishments in a multi-plant enterprise have it; a distributing enterprise and a manufacturing enterprise may be so closely bound in interests as to have, as it were, a partnership-type of institutional mind; but among the numerous enterprises of an entire industry the spirit of particularism is so strong that a genuine

[2] See *Bulletin of the Taylor Society*, Volume XVII, No. 6, December, 1932.

spirit of co-operation in pursuit of the major objective for which they exist cannot find a place.

But on a still larger stage—the co-ordinated management of the entire commerce and industry of a nation—scientific management has already manifested a notable influence. The planning involved in the concept of national planning is the technical planning of scientific management, including the body of related technique, and is not the planning connated by the earlier generic use of the word. In the totalitarian countries today is expressed in the management of their economies a development of scientific management on a large scale.

Scientific Management and Democracy

Lest the reader become alarmed, let us note parenthetically at this point two aspects of scientific management. First, let us recall what has been said about management as an art and what part national and personal characteristics play in it; especially that the spirit and interest behind the technique determine the objective of its utilization. Second, let us realize that scientific management is a way of doing things—of achieving objectives—and as a way of doing things is a-moral. It can be employed by the racketeer as well as by the business man. In fact, I have read about some startling scientific management technique in moderate degree in popular magazine stories of the organization and methods of great racketeers, such as Al Capone. The sooner we understand that it gives power to evil, the sooner we will have more regard for it in the struggle against evil.

Thus we do find a resource to scientific management methods in the practices of totalitarian states in the regulation of their economies. There are perhaps two reasons why, after failure in its reach of influence on an entire industry, it should succeed on the larger scale in respect of the total industry and commerce of a nation. The first reason is that of compulsion; the same reason that led to scientific management in the isolated cases of Admiral Peary and the circus in pre-scientific management days; the job couldn't be done otherwise, and they wanted the job done. The leaders in the totalitarian states are as serious and energetic as was Admiral Peary. The second reason is that the state can have a single directing mind, personal or institutional—more likely the latter—whereas an industry appears not to be able to develop such a directing mind.

At any rate, scientific management has had a profound influence on the organization and management of totalitarian nations. It has given them power. It has made the problem of destroying totalitarianism more complicated and more difficult for the democracies. The problem is more complicated and difficult for the democracies because they can acquire the strength to destroy totalitarianism only by adopting scientific management on a national scale, and they must develop a scientific management that is consistent with democracy and a guardian of it; whereas the totalitarian nations have pursued the easier course of sacrificing democracy.

In the long run, although harder to develop, I believe that the scientific management that is consistent with democracy will be more enduring than that acquired more easily at the sacrific of democracy. It will be founded more firmly on the fundamental aspirations of a people. Experience has indicated that scientific management in an individual plant that has been developed along lines of democracy is more enduring than scientific management that has been autocratic in its development.

However, the significant and urgent fact is that the totalitarian states are strong because of the degree of scientific management of national affairs they have developed; and notwithstanding its possible lack of endurance because of the nature of its foundation, it may remain strong enough for a sufficient period to effect the objective of destruction of the democracies. Honest citizens without organization and direction, and employing the measures of casualism, cannot combat effectively a gang of thieves that is well organized and directed by a master mind, and that utilizes the most effective methods and devices developed by investigation and experiment.

Our English friends, because they are bearing the burden of the struggle, because of the compulsion of immediate circumstance, are rapidly developing a direction of their national affairs along the lines of scientific management. And they are doing it with an admirable faithfulness to the principles of democracy. They may not be strong enough to win the victory alone—our victory as well as theirs, the preservation of our democracy as well as of theirs. Of course we are disposed to help them preserve the democracies, and are helping them. But *disposed to help* does not describe a very determined and vigorous state of mind. We should be *determined* to help to victory. Determination would stimulate us also, in the face of crisis for democracies, to establish our national institutional mind and organize our national efforts to achieve the common objective along the line of scientific management. As a people we are still loitering along the way of casualism. I believe our leadership

desires to be more energetic and to organize our contribution to the struggle more effectively, but in a democracy they must wait on the emergence of a corresponding desire in their followship.

When Taylor, back in the early eighties, introduced inductive science into the homely affairs of the shop, he created a great new force in the world. It has revolutionized the management and the productivity of private enterprise, and thereby helped to raise the standard of living of peoples. But just as the tractor, so beneficent in agriculture, has proved to be a destructive force where adapted to the purposes of war, so also scientific management, so beneficent in the pursuits of peace that improved conditions of living throughout the world, has been adapted to purposes of destruction of democracy. It is a challenge to democracies to utilize the same powerful force for destruction of the evils of totalitarianism, and thereafter for still greater achievements in improving conditions of livelihood among peace-loving democratic peoples.

Some Observations on the Background, Scope and Significance of the Function of the Management Engineer

(Continued from page 186)

tion to specialize in one field; remember that the broader the foundation, the higher and firmer the edifice which may be erected thereon;

4. Master economics (especially industrial) and statistical method; fortified by these two disciplines, you will inevitably seek to support your conclusions not by opinions and guesses, however brilliant, but by scientific findings;

5. Know the literature of management, and especially that deriving from England, France and Germany, for such knowledge will open up vistas of accomplishment which will prove powerful stimuli to your own thinking and research activities;

6. Be certain that any work you undertake will persistently yield intellectual growth and satisfactions; otherwise you will be unable to qualify for broader areas of usefulness;

7. Learn to practice successfully the difficult art of human relationships, for more men arrive at the pinnacle of success by proficiency in this art than by any other means;

8. Give of yourself, your time, effort and resources, to the profession to which you belong, for you will gain much from regular contacts with those who have kindred aims and viewpoints;

9. Live up, in every task of technical character you are called upon to perform, to the highest requirements of scientific procedure, always bearing in mind that facts, often stubbornly elusive, are precious assets in any attempt to carry conviction to those who pass upon the product of your work;

10. Finally, don't take yourself too seriously; err on the side of under-statement; show tolerance for differing points of view; be an intellectual adventurer.

REVIEWS

The Management Counsel Profession. By Joel Dean, Indiana University, Bloomington, Indiana, pages 89. ($.75.)

This admirable review of the field of management service is of practical interest to every progressive executive as an aid in deciding whether or not he should employ business consultants, and the way to select them.

The findings are based primarily upon interviews with some seventy-five chief executives and contacts with management consultants. But instead of adopting the usual "survey" form of statistical averages of answers to extended questionnaires, the data are analyzed in the light of the author's experience. The conclusions are presented in a way to give the reader, not a tabular report, although a few tables illustrate and confirm the findings, but instructive advice, worked up moreover in an interesting and readable style.

The field covered in the booklet can best be shown by the titles of the five chapters. Chapter I treats of "Nature and Scope of Professional Management Counsel."

Tabulations of titles used by different consulting firms show the old designation of "efficiency engineers" used by only four out of three hundred listings.

The demand for services varies with the business cycle, the industrial growth of the concern, the executive's experience and the "fashions in management technique."

"Engagement of Consultants" in Chapter II indicates the haphazard manner of selecting counsel, nearly half of those employing consultants consulting no one before engagement. This in turn illustrates the high-pressure salesmanship so often exerted by the consultants.

"Factors Affecting Success of Consulting Engagements," Chapter III, and "Benefits to be Expected," Chapter IV, analyze on the one hand the factors in successful consulting practice and the defects of incompetent practioners and, on the other hand, the type and extent of results attained for the clients. In discussing the relative importance of the standing of the firm versus the job representative I feel that the author fails to recognize fully the fact that firms of highest standing follow up and supervise their jobs so thoroughly that the skill of the man on the job may be of lesser importance.

In the "Conclusion," Chapter V, the points in the book are summarized and the selection of the consultant emphasized as perhaps the most important factor in the success of an engagement. Reviewed by SANFORD E. THOMPSON, President, The Thompson & Lichtner Co., Inc., Boston, Mass.

What's Past is Prologue. By Mary Barnett Gilson, Harper & Brothers, New York, 1940, pages xii, 307. ($3.00.)

If there is a better all-round book for those interested in management and, at the same time, one more easily read, I do not know of it. There are scores of books by management technicians but they rarely have interest except for the specialist. Then we have the reportorial type of books coming out of the academic world which generally lack something born only of intimate daily association with work processes. Essentially Miss Gilson has told us in intimate and lively fashion the story of her day to day experiences and impressions gained through varied and responsible contacts with industry—principally, of course, during the dozen years spent in the Clothcraft Shops in Cleveland, large-scale makers of men's clothing, and a plant in which scientific management after Taylor's own heart was developed in the production department but, alas, not elsewhere. This situation with valuable lessons for all is canvassed in masterly style.

Miss Gilson helps us to see the mental process by which starting with a conservative, little-interested, normal Pittsburgh point of view as to labor and labor relations, she developed into an employment manager possessing not only a keen sympathy with the attitudes and problems of labor but able to speculate wisely about the conduct of the employer-employe relationship as it is developing under our American democracy.

It is a grand thing to see any human being able to be serious as to a given situation and yet handle with a light touch her own relationship to it. One gathers as much light and leading from incidents in which the author admits personal error as from those where confident in the strength of her own position she gave no quarter to the opposition. This book certainly demonstrates that to have labor relations right, somebody has to take infinite pains. Such an atmosphere as pervaded this shop —an atmosphere which attracted people from all over the world —was born not only of a respect for every individual in the plant but a willingness to take the trouble to give expression to this respect. After reading this book one wonders why labor relations are as good as they are with so little attention normally paid to the subject.

Especially interesting are the pages in which Miss Gilson tells how she came to realize the weakness of the "*Our* Shop" idea—a plant unrelated to the rest of industry and to the rest of the world. Present day readers will possibly not appreciate what advanced thinking this was for the time. Only as the workers come to realize these wider relationships can we get away from the danger of labor as a pressure group.

A good many individuals of many different kind walk through these pages and on the whole, they have been fairly and discriminately dealt with. It is a fine thing to have on the record such an intimate picture of Richard Feiss, a man the value of whose contribution to scientific management has never been fully appreciated. As is true of all good managers, he was what he was largely because of the crew about him. But he contributed to their making quite as much as they did to him.

A book on management is about the last place one would expect to find humor. But there was a good deal of fun floating about where this lady moved and had her being. And it is pleasantly reflected in these pages.

This is a strong book telling the day-to-day story of years spent in staking out new industrial territory, all seen through a smart pair of eyes. Reviewed by MORRIS L. COOKE, Consulting Engineer, Philadelphia.

Operation Analysis. By Harold B. Maynard and G. J. Stegemerten, McGraw-Hill Book Company, Inc., New York, pages ix, 298. ($3.00.)

This is not just another book on time and motion study. It has little to say on time study specifically. Therein lies its merit of individuality. At long last someone has finally devoted a whole volume to that most fundamental of all time and motion study techniques, the *analysis* of the *operation* and its attendant conditions, which must precede any and every time study which is worthy to be dignified by that term.

Dr. Taylor during his lifetime had ample cause for worry in the far wider acceptance of the superficial, mechanical use of time study than of its true appreciation as he used it and expected it to be used. And many of "the faithful" have worried plenty more in the years since. Our modern term "methods engineer" might perhaps have been a godsend to him—and to both employer and employe generally throughout industry—if someone had only coined it fifty years or so earlier. How different might have been the results if nobody had ever heard of a "time study man" but only of "methods engineers."

Maynard and Stegemerten cannot correct the mistakes of fifty years. The best minds in the management field have been continually trying and with far from gratifying results. But give this book the wide acceptance and use it deserves and Frederick W. Taylor's time study could become in the future what he visualized for it—a truly (and always) constructive tool.

The earlier part of the book describes the functions of methods engineering, sets up six types of methods study which the authors recommend as standard and follows with a chapter on the field of application of these six types. The conventional methods of charting are explained in detail—process, operation process, flow process.

A full two-thirds of the book is devoted to an elaboration of the fundamentals of the analysis itself, a chapter being allotted to each of the eight: Purpose of Operation, Operations Performed on Part, Inspection Requirements, Material, Material-handling Methods, Set-up, Tools, and Workplace Layout, Possibilities of Improvement (a to j), Working Conditions.

Chapter XXI brings these together in a condensed Operation Analysis Check Sheet. This is a sixteen-paged form starting with operation identification, yearly labor cost, etc. (to determine its importance, type of analysis indicated), and description of present method. Following that are the eight fundamentals which should always be considered on every job of importance. Under each head is a list of leading questions (from ten to as high as thirty) and space opposite each for comment where the question suggests a betterment that can be made in the operation being studied.

The authors have drawn generously from their long experience (in both class room and factory) in the training of engineers and factory executives and have produced a work which should be in constant use in every manufacturing establishment. Reviewed by HARRY MELVIN SUTTON, Management Consultant, Boston.